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The Viscosity of Road Tar

THE increasing concentration of road traffic and the heavy cost of upkeep of the road surfaces has directed attention to the properties of fluid surfacing materials. Of the two surfacing materials in general use, bitumen is imported, whilst tar is a home product. Unquestionably both have their values, and until a better use can be found for tar by hydrogenation to produce motor spirit, road tar is likely to remain one of the major products of the heavy chemical industry. At first the tars used were light and fluid, but in the course of time a variety of materials was discovered, each having some specific use in the preparation of road surfaces. The lightest tars may be applied in the form of a thin surface film which is then covered with broken stone; when used in this way as a surface dressing, the viscosity of the tar may vary between 10 secs. and 100 secs. as measured by the standard viscometer of the British Road Tar Association. A similar tar is used for making tar macadam by the cold process. For the semi-hot tar macadam process a tar is used within the range 70—120 secs. at 35° C.; this can be compared with the lighter tar by the statement that a tar of 100 secs. at 35° C. has a viscosity of 280 secs. at 30° C. For the hot tar macadam process a yet thicker tar is used flowing at 10 to 25 secs. at 60° C.; again for comparison, a 15 secs. tar at 60° C. has a flow rate of 6,300 secs. at 30° C.

The wide range between 10 secs. and perhaps 8,000 secs. makes it impossible now to measure viscosities of all road tars in one instrument and at one temperature. Nevertheless, the temperature at which the tars are rolled when making the surface is graduated according to the class of tar that is treated. It is not altogether surprising, therefore, to find that the viscosity at the temperature of rolling is very similar for all road tars and for all road surfaces. The values of the viscosity at the temperature of rolling appears to lie between 30 secs. and 200 secs. This, of course, is quite a considerable variation, but it is considered by the Standardisation of Tar Products Tests Committee that the agreement is sufficiently close to encourage evaluation of tars by noting the temperature at which they attain a standard, if arbitrary, viscosity. For this purpose a flow of 50 secs. in the standard instrument has been provisionally selected. The temperature is termed the "equiviscous temperature" and the Tar Products Tests Committee has recommended that the new system should be adopted by the road tar industry.

There are other disadvantages inherent in the old "seconds" system, and these were enumerated by Mr. G. H. Fuidge, in a recent paper before the Society of Chemical Industry. There are disadvantages due to confusion between buyer and seller arising from the fact that because different temperatures are used to evaluate lighter and heavier tars, the one figure of "seconds" is no longer adequate, nor is the relationship between the viscosities at the three standard temperatures understood by those not fully conversant with the physical properties of tar. Moreover, when viscosity is represented by a number of considerable magnitude, units have little significance, and even such significance as they have is not constant over the whole range, but becomes smaller as the viscosity increases. The variation in viscosity of the tar by addition of fluxing oil varies with the initial viscosity of the tar, and when tars of different viscosities are mixed the viscosity of the mixture is not the true mean of that of the constituents. By the system of equiviscous temperatures all these objections may be overcome.

The essential difficulty appears to lie in the method of measuring the new unit. It happens fortunately that if the logarithm of the temperature at which a determination of viscosity is made is plotted against the logarithm of the time of flow in seconds given by the British Road Tar Association's standard viscometer the points lie on a straight line. At the most, therefore, two *accurate* determinations may be all that are necessary. Unless one of the temperatures selected happens to give a figure near to 50 secs., it seems desirable to perform the determination at three temperatures—a matter requiring no little time, and, it may be, an impossibility in many works' laboratories. It also happens that an approximate figure for the E.V.T. can be calculated from one determination. Nevertheless this is only an approximation and the industry will be indebted to Mr. Fuidge for devising and standardising a viscometer whereby the E.V.T. can be directly determined. This instrument consists of a torsion viscometer in which a cylinder suspended from a torsion head rotates in tar contained in a second, outer, stationary cylinder heated in a water bath. The torsion head is turned through 180° and is then allowed to swing back. The instrument is so apportioned that the standard conditions of "50 secs." are reached when the torsion head overswings by 45°. There has been so much interest in the viscosity of tar oils for various purposes that we are constrained to inquire whether any evidence has been found of the dilute gel structure in tar oils referred to in these columns on March 7. Tar is a cracked product and might be subject to the same phenomenon as are cracked petroleum oils.

Notes and Comments

Mining Royalties and Rents

THE Mineral Resources Department of the Imperial Institute has rendered a useful service to the mineral industry by bringing together in handy form in its book on "Mining Royalties and Rents in the British Empire," which we reviewed last week, the information available on the subject for the Empire as a whole. As a result of many inquiries, the Department circulated to Government Departments in British countries interested in mineral production and to the corresponding members of the Institute a comprehensive questionnaire. Some 75 officers of overseas Government Departments gave valuable assistance, while information regarding royalties payable in Great Britain was obtained mainly from mining companies and owners of royalty rights. The systems in force exhibit great variety in dealing with different local conditions. Most governmental decisions on royalty policy involve the reconciliation of a number of competing considerations. In the first place an administrator wishes to conserve the mineral resources of his country; secondly he wants to raise revenue from its minerals, and thirdly, he seeks to encourage the development of a prosperous mining industry which will be a powerful factor in the general development of the country. He will therefore resist the temptation to fix royalties too high lest he should retard the development not merely of a mining industry but of other industries and sources of employment. At the same time he will take care that the "certain" payments stipulated in mining leases are adequate to secure that the property shall be developed and not merely taken in lease to prevent development.

Cut-Throat Salt Competition

CUT-THROAT competition between English salt factories and unrestrained salt importations from countries whose salt output is heavily subsidised and who have much lower economic standards were cited as two outstanding problems confronting the home salt industry by Mr. F. W. Clarke in his speech to the shareholders of the Salt Union, at Liverpool last week. The Salt Manufacturers' Association continues its activities, but the keenest competition is taking place between members and non-members, as a result of which salt prices have receded, thus affecting the profits of such concerns as the Salt Union, although the effects have been mitigated to an appreciable extent by the economies they have succeeded in establishing. The Association, in conjunction with other manufacturers, has made a further application to the Import Duties Advisory Committee to increase the duty on imported salt. No member of the trade has expressed any objection to this application, so that for a second time in its history (the other being the successful application for a marking order for foreign salts) the trade is unanimous. So far, efforts to bring about a new arrangement in the trade have not proved successful, although a great deal has been done to that end. Since the Salt Union was formed pannage representing over a million tons of annual productive capacity has been closed down, chiefly through loss of important markets such as India, the United States and the bulk of the chemical salt trade. The chairman of the Salt Union appeals to labour leaders and organisations to recognise that the present difficulties of the trade must eventually react to the disadvantage of the labour employed in the home salt industry and to support the trade's application to the Tariff Commissioners.

The Chemical Council

TO Midland chemists is due, apparently, the chief credit for the measure of co-operation between the three principal chemical organisations which found expression last year in the appointment of the Chemical Council, whose object is to administer a fund for the co-ordination of scientific and educational publications, the publication of new discoveries, the promotion of research, the maintenance of a library and the provision and equipment for a suitable building or buildings for such purposes. The president of the council told the Midland chemists at their recent annual dinner that the provinces had set an example to headquarters and that of all the provinces the Midlands had provided the best known example of co-operation. Little has so far been heard of the proceedings of the Chemical Council, but we learn from the annual report of the Institute of Chemistry that the council has held several meetings, has formulated standing orders, has appointed committees for various purposes and has prepared an appeal for the fund which is being raised for the purposes mentioned. It has also made progress with the consideration of the present cost of publications of the chemical societies and has had under review other matters of importance to the constituent bodies. The Institute, in its report, commends the appeal to all who are interested in chemistry and its applications in industry and commerce and invites those who feel they are able to assist in furthering the appeal to communicate with Mr. R. B. Pilcher, registrar, who is also hon. secretary of the Chemical Council.

Helping the Retailer

A SCHEME is shortly to be launched to provide the retail trader with an organisation which will enable him to settle his weekly and monthly accounts with a single cheque. Thousands of retailers, large and small, get their supplies from a variety of wholesalers, and pay each separately. Each payment costs them 3½d., 2d. for the cheque and 1½d. for postage. By means of the new clearing house, one single cheque will settle each retailer's accounts, the clearing house undertaking to distribute the various payments due to the wholesalers. To cover the costs of the clearing house, the retailer on joining will pay an annual fee varying from 10s. 6d. in the case of those with an average of 15 accounts a month to three guineas in the case of those with a hundred accounts a month. In addition he will pay 1d. for each account the clearing house settles for him. It is estimated that a retailer settling a hundred accounts per month will save a total of £9 1s. per annum (after allowing for subscription and fees), or over 50 per cent., excluding the saving in time, labour and stationery, which is often greater in value than the actual cash. The scheme, which is to be run by the Commercial Clearing House, Ltd., with Sir George Hamilton, M.P., as chairman, is to come into operation on June 2.

Topical Problems in the Paint Industry

Grinding and Standardisation of Products

GRINDING and the standardisation of products in the paint industry were discussed by Mr. H. C. F. Randall in a paper read at a meeting of the Oil and Colour Chemists' Association, held in London on March 12, Mr. D. Wait presiding.

With regard to grinding, Mr. Randall said this word was used as descriptive of the problem of mixing pigments in media to the degree necessary for the making of paints and the broad principles of this were probably universally accepted. The question of wetting properties was purposely avoided at the moment. Discussing the factors involved in grinding he pointed out that it had been said that when dispersion was accomplished, the problem was solved, but the difficulty lay in accomplishment in an economic manner. Many pigments, the particles of which were surrounded by air or were only loosely held together—such as zinc oxide—presented little difficulty. Prussian blues and certain deep shade carbon blacks, however, were not so easily dealt with.

Principles of Available Methods

Considering the principles of available methods for dealing with the problem, so far as conventional milling machines were concerned, Mr. Randall said they were fundamentally the introduction of pigment and medium to the space between two moving surfaces, the factors involved being geometric arrangement of surfaces, type of feed to surfaces, pressure, clearance, microscopic structure of surfaces, relative speed, length of travel between surfaces and length of feed line. After discussing these matters in some detail, the author said that the further the problem is investigated the more complex it becomes and the less surprising is the large number of types of mills available. Most of these had been the result of evolution with, in many cases, little or no scientific reasoning involved. This had to some extent taken place by paint manufacturers comparing various mills and selecting types which gave the best results. Unfortunately the process was slow, because mills were expensive and were more often bought to be used in production than for testing efficiency and subsequently being scrapped. Some of the more efficient modern mills were the result of scientific thought and had been developed almost to the limits of possibility of the particular design. Thus, in the case of twin, three, four and five roller mills, relative speeds and type of pressure had been investigated and the best compromise had been incorporated in some available mills which gave enormously superior results to the old-fashioned roller mills. He suggested that two pairs of twin rollers with the first pair feeding on to the second would be more efficient than a triple roller, the only drawback being that four rolls cost more than three, as far as capital expenditure was concerned. Obviously the arrangement could be extended to the use of four pairs of rolls rather than a single five roll mill.

Is Absolute Standardisation Wanted?

Coming to the second problem, viz., the standardisation of products, this was intimately associated with such things as grinding. If a different type or degree of grinding had been applied to a paint, the product would in many cases not be the same. The presumption was being made that absolute standardisation of products was required and it was therefore desirable to introduce a system of checking whereby this was assured. Where large outputs of chemicals were concerned, this was easily carried out. Thus, for instance, a salt such as lead acetate could be positively tested for freedom from possible adulteration and could, if necessary, be analysed for percentage of lead, and these tests could be made sufficient to ensure standardisation so far as the user was concerned.

With paint, however, the problem was entirely different. The positive way of testing was to try each paint practically under all required conditions. This, however, was obviously hopelessly uneconomic even with large batches of finished material, so that the paint manufacturer was faced with the alternative of "trusting to luck" that everything went right, or standardising to the limit of economic possibilities those properties which were apt to stray from standard. Consistency had long been considered one of the obvious properties to standardise but attempts to measure it had usually merely indicated how complicated consistency was. A tremendous amount of work had been carried out on the various problems connected with consistency and the latest outcome had been the discovery of thixotropy. Even at present, therefore, the industry was faced with the problem of minimum consistency (or true body under shear), maximum consistency (or false body), variation of consistency with time or thixotropy, whilst other variables were yield value and variation of any type of consistency measured with shear.

Arbitrary Methods of Testing

Indeed, said Mr. Randall, the subject was so complex that it needed as thorough fundamental investigation as did grinding. Arbitrary methods of testing certain combinations of properties were available in a wide range of instruments based on passing paints through tubes, allowing steel balls to drop through the paint, or a cylinder to revolve within it, allowing weighted discs containing small holes to fall through the paint, and so on. Any sound instrument should give reproduceable results but the matter which concerned the paint manufacturer was whether the result would enable him to standardise his product in regard to a property which interested the consumer. It had been found in practice that most available instruments which were sufficiently rapid for works use were apt to be more dangerous than they were useful. For instance, the mobilometer type had, in actual use, given widely different figures for two paints of identical composition. The difference in this case was ascribed to false body due to degree of dispersion of the pigment. Actually the performance of the paints from a practical point of view was very similar. Obviously, an instrument which gave different figures for paints with similar practical performance did not measure a vital property and therefore was not at the moment desirable for the standardisation of paint. Investigation of the various types of instrument showed that they mostly dealt with a comparatively thick film or layer of material. It had always seemed desirable, however, to standardise consistency in its valuable form, and this thought had led to a prolonged investigation of the subject.

The Practical Value of Consistency

Common sense indicated that the practical value of consistency was not how the paint looked in the can but how it brushed or sprayed. A stiff or sticky brushing paint would be said to have a high consistency, whilst a thin or easy brushing paint might be said to have a low consistency. This had led to the attempt to measure the pull in a brush due to a paint. The difficulties in obtaining any really robust and sensitive instrument using brushes were obvious, and the brush was early replaced by a metal plate, which, whilst not giving results exactly comparable with brushing, at least simplified the problem and enabled a robust and easily used instrument to be designed. Exhibiting the instrument he had designed, Mr. Randall explained that the principle involved was the use of a thin film of material such as obtains in actual brushing practice and this was enclosed between two surfaces of ample proportions taking the form of a circular rod and concentric slide. With a thin layer of paint

similar figures were obtained with two samples, indicating that real minimum consistency had been measured.

The underlying principle of the instrument in question, continued Mr. Randall, was not considered during its evolution. It was interesting, however, to consider what was involved. The factors operating in consistency of paint when in the state of a film were much the same as those obtaining in grinding; in fact, the instrument in question involved the two surfaces and an intervening space—as in grinding—the difference lying in degree of the various factors. Considering the condition existing between two surfaces such as these, which were in motion, it was pointed out that there were innumerable particles of pigment suspended in a liquid, but what were the forces at work in the system?

There was the viscosity of the liquid, tension between pigment particle and medium—much like the effect when glue was applied to a solid surface—and the opposition to motion caused by the interlocking of pigment particles. Anyone testing a brush on a film of paint was aware that there was considerably more pull with a thin film than with a thick one. Why was this so? The forces acting were viscosity of liquid and resistance of particles. It appeared probable that in thin films the viscosity of the liquid played a larger part than the resistance of particles, whereas in very thick films the reverse was the case. This, of course, assumed that the force due to resistance of particles was smaller than viscosity in normal paint systems.

Summing up, Mr. Randall said the problem remained largely a matter of conjecture and before any degree of solution was reached it needed very prolonged fundamental investigation of particle size, shape, surface forces, inter-particle magnetic type of forces, wetting due to media, and so on.

Points from the Discussion

The CHAIRMAN, referring to the various types of grinding machine discussed by the author, said that he had not yet seen any attempt made with an impact grinding machine in which two streams of pigment in oil or liquid were impinging upon each other. With regard to the suggestion that the speed of grinding became the limiting factor, he said it was well known that as a roll mill went faster and faster it began to throw off material from the edge of the roller and a scraper was used in order to remove it, for which purpose the mill was slowed down. Why not increase the speed, say, from 100 r.p.m. to 1,000 r.p.m. and not have a scraper at all, *i.e.*, allow the mill to throw material, although that would probably involve certain cooling devices for the mill and perhaps also for the operator.

As to steel rollers being smooth, he doubted if this was so when dealing with very fine particles of pigment. At the same time, he suggested that the forces existing were sufficient to prevent the particle really touching the steel at all and that the particles were really held entirely in the medium. This matter was not so simple as the author rather suggested and personally he was inclined to doubt whether any particles were broken between the surfaces of the rollers, but that they were almost entirely broken between themselves. With regard to the suggestion of a series of twin rollers one above the other with the material going through more quickly with succeeding rollers and the possibility of getting better results in that way, he was doubtful about that also. In the final degrees of grinding it was necessary to have the rollers closer and therefore they would have to run much faster to take the same output, as output must be the same through all the mills. Therefore, he was doubtful, apart from the cost of the twin roller, whether there would be any advantage in this suggestion.

Mr. RANDALL replied that there existed at the present time centrifugal mills which, revolving at enormously high speed, threw out material which was collected in an outer casing. As to the chairman's suggestion that steel rollers were not smooth, he had taken the opportunity of inquiring from a metallurgist on this matter and had been assured that steel was very reasonably smooth, although personally he had not been able to examine steel rollers microscopically. In practice he believed that any irregularities that existed would be smoothed over and closed up by the material. With the chairman he would not be surprised if particles were actually broken among themselves and not on the rollers, but where very loosely ground paints were concerned he was inclined to wonder whether any real dispersion occurred or whether it was only a very loose breaking up. As to the twin rollers, he had merely suggested that the use of these might be an advantage. It was the fact that many paint manufacturers to-day actually used two double-roll mills, one feeding into the other, whilst many paint manufacturers used two triple-rolls, one feeding on to the next, whilst even more recently five-roll mills had been used. It was, however, a matter of argument as to which was the best and he personally would not be dogmatic about it.

Limiting Speed of Rollers

Mr. S. P. MAAS, speaking of the gap between rolls and the pressure between the gap, said there must be deformation of the grinding surfaces themselves and that was borne out in the tendency to-day to make axles of bearings very much heavier in roller mills in order to obtain rigidity. He was not altogether sure that the limiting speed of rollers was due to overheating. In the case of roller mills, when a certain speed was exceeded, a film was taken up by the roller but it did not become any greater. In the case of certain mills the claim was made that there was a pressure engendered which helped the feed but generally speaking the feed was by gravity and there must come a time when the roller could not take up a thicker film. Thus after a certain speed the output was not increased so that there was a limiting speed due to the slipping that took place between the film taken up by by the roller and the material lying on it. As to what happened with a multiple roll mill in series, such as the author had suggested, the limiting output of a multiple-roll mill was governed by the length of the roll. In the case of a five-roll mill, the film going through the first two rolls must be comparatively thick, otherwise the length of the roll would not take it up, and as the film was squeezed out further in successive rolls, the speed of the rolls must be increased to take it, and therefore a stage was reached when the speed was limited by this consideration. Perhaps with a series of two-roll mills that would not come so much into play and a greater degree of fineness might be achieved.

Mr. RANDALL said he believed the common practice in many roller mills was to make the roller 0.004 in. larger in diameter in the centre than at the sides so that when the rolls were tightened up there was practically a straight line across them. It was interesting to hear that the limiting speed was not due to overheating, although in his experience he had found that even a two-roll mill could be tightened up until it over-heated, and that actually limited the grinding. Finer grinding could have been obtained if it had been possible to tighten up more, but that was impossible because over-heating occurred and the roll began to expand in the centre and give rise to a dry ribbon of material. He inquired of Mr. Maas what was the effect of the width of the bar of single-roll mills and whether that contributed towards grinding or not.

Fluid Pressure

Mr. MAAS, speaking with regard to the tightening up of rolls, said he had no doubt that fluid pressure came into play as long as there was lubrication, but once lubrication was broken down the result was two dry surfaces together. With regard to the width of the bar in single-mill working, his own impression was that the width had not so much effect on the fineness as on output, *i.e.*, with a narrow bar it was possible to get a very high pressure on it but the output was small, whereas with a broader bar with the same pressure per square inch, it was possible to get bigger outputs.

Mr. F. O. OKELL suggested that something might possibly

be learned about grinding if it were considered from the point of view of dry grinding hard particles. Grinding for ore sampling purposes, for material to pass through a sieve of a definite size, there was always a difficulty with the last particles because they would not grind to the fineness required, although the load on the machine was fairly heavy. In grinding to pass 30 mesh sieve it was possible to get 90 to 95 per cent. through, but there still remained the small quantity which would not pass the mesh specified. If that were put slowly through the rollers there would still be 50 per cent. of that percentage which would not pass the sieve, but if the roller was definitely over-fed, then it was possible to get a large proportion which would pass the sieve. Gentle feeding, however, would not do it. He was inclined to think that the same thing would apply if oil were present as in the case of grinding paint.

A Remarkable Development

Dr. L. A. JORDAN said that nobody had mentioned the microniser process which was a very remarkable development worth studying. He did not believe it was yet in the hands of colour-makers in this country, but it consisted of causing pigment particles to impinge and work on one another in a compressed air stream and the result was grinding to almost colloidal dimensions without the material touching any other surfaces.

Mr. RANDALL said the chairman had indicated that process and it would be interesting to know more specifically as to the sizes of particles which could be treated in this way. Did it apply, for instance, to particles of the sizes obtained in paint films down to a diameter of 0.0005 mm., or did it only apply to larger particles?

Dr. JORDAN said that the process had been used with flowers of sulphur which was probably as fine as any ordinary paint pigment was ever likely to be. The difference could be seen when flowers of sulphur so ground were placed in water, because they stayed up whereas flowers of sulphur ground by other methods quickly settled to the bottom. The process appeared to be of the nature of colloidal dispersion without any adventitious aid.

The CHAIRMAN said he had seen barytes put into a microniser and come out as fine as Dr. Jordan had suggested, and it was all done in one operation. Speaking on the comments in the paper regarding standardisation of products, he said that if the author's apparatus measured a reasonable consistency of paints it was indeed interesting and he would like to know whether it was possible to obtain by it two figures giving the limit in any one type of paint consistency and also whether the author could say what the experimental error was and whether it could be ascertained within one unit or five units. It would also be interesting to know if similar figures had been obtained with regard to paint applied by the brush. Only one method of applying paint had been referred to in connection with the instrument, but there were various ways of applying paint and it would be interesting to have figures for spraying and brushing and also the degree of experimental error.

Large Degree of Simplification

Mr. RANDALL said the chairman must be very optimistic if he thought that consistency problems could be solved in one fell swoop, and certainly he could not promise that even with his instrument. Unfortunately, paints were very complicated systems and the figures obtained with the instrument depended very largely on the structure of the paint. Therefore, it was impossible to give definite figures such as had been asked for but it was possible to effect a large degree of simplification by the apparatus, and to say that a finishing paint should conform to a certain characteristic. The usual method in using the instrument was to plot a curve rather than to take one figure, and in that way it was possible to ascertain what would be a sticky paint and generally to determine the stoutness of a paint.

Dr. S. F. NEW said the author's instrument seemed to have points about it which previous instruments had lacked. It was right in his view to insist on the necessity for examining thin films because, in the ideal state, in each bristle of a brush there was only a thin film. It was obvious from the tremendous amount of work and the large number of instruments which had been developed for this purpose of measuring consistency that no one instrument would tell the whole story.

Mr. RANDALL said that perhaps in the paper he had taken a rather pessimistic view of the capabilities of the instrument. As a matter of fact, it had been used for a wide range of materials and a range of film thicknesses met with in practice. The instrument was constructed to be used with three slides dealing respectively with films of minimum thickness and maximum thickness as encountered in practice, together with an intermediate thickness of film, but insufficient work had been done so far to justify a paper on the experience gained with it. Nevertheless, experience as far as it had gone enabled him to standardise paint whereas he had not been able to do it before owing to certain shortcomings in other instruments. At the same time, he agreed that no one instrument would tell the whole story, and it certainly was not the claim for this instrument that it would tell the whole story. The idea was merely to standardise paints in a simple manner. To obtain the whole story it was necessary to measure thixotropy and false body and the type of consistency, as measured by his instrument, and obviously this would be hopelessly uneconomic.

Object of Standardisation

Mr. FRASER SMITH suggested that the true value of this instrument was rather being overlooked, because it made it possible to obtain a standard consistency by getting the same graph every time. If the varnish was of a standard consistency as determined by ordinary viscometry methods, the paint should come within the same standard and from that point of view this instrument definitely provided a means for standardising the final paint.

Mr. RANDALL agreed that if varnishes were standardised with regard to viscosity, and if the pigment was exactly the same and the degree of grinding was also standardised, there should be no need to standardise the finished article. The object of standardisation was more to check these various points, and it was for that reason that this instrument had been evolved.

Irish Chemists' Association

A New Organisation Formed in Dublin

THE Irish Chemists' Association has been founded in Dublin for analytical and industrial chemists and others engaged in the chemical profession. Professor T. Dillon, D.Sc., University College, Galway, has been elected president; and Mr. B. Fagan, chairman of the Dublin section of the Institute of Chemistry of Great Britain and Ireland, has been elected vice-president. The objects of the Association are the co-ordination of chemists' activities, the retention of posts demanding qualified chemists for properly qualified persons, and the improvement of salaries and conditions of employment. The president pointed out at the inaugural meeting that the Government had already shown its appreciation of what science could do to further the present intense industrial development. Chemists had been sent abroad for specialised training in chemical engineering for the sugar beet factories. An Industrial Research Council had been set up to keep in touch with new problems. At the same time the value of technical experts to industry was not yet recognised by business men as in England and on the Continent. Miss P. Ryan was elected treasurer; Mr. de Bheal, hon secretary; and Messrs. T. Twomey, A. G. Burnell, P. J. Cahill, R. O'Riordan, D. Mellon and J. Wilkins, committee.

Germany's Chemical Trade During 1935

A Definite Gain in Exports

FOR the first time since the boom era, Germany's export chemical trade in 1935 showed a definite gain. That the gain in total value was not due to rising prices is shown by a more marked expansion in volume of shipments, indicating continued depressed and, in fact, further lower prices, in terms of reichsmarks.

GERMAN EXPORTS OF CHEMICALS AND ALLIED PRODUCTS.

Year.	Quantity. Metric tons	Value. Reichsmarks.
1932	3,293,994	743,387,000
1933	3,046,081	697,513,000
1934	3,235,311	660,770,000
First 11 *months :*		
1934	2,936,452	602,516,000
1935	3,272,075	604,632,000

The 1935 trade improvement occurred in the second half of the year, following the institution of the more effective system of export subsidisation by Government bounties taken from large funds created by special levies, ranging from 1 to 7 per cent. of the value, upon industrial production destined to domestic consumption. In the first half of the year exports were considerably under the corresponding period of 1934, but with the more liberal export subsidies available from July, enabling German exporters to meet virtually any foreign price competition providing the business under negotiation appeared sufficiently desirable from a national economic point of view, a marked recovery was achieved in exports in the succeeding months, as disclosed below :

GERMAN EXPORTS OF CHEMICALS AND ALLIED PROUCTS.

Period.	1934.	1935.	1935. Reichsmarks. Difference.
First half	333,233,000	314,244,000	— 18,989,000
July-November, inclusive	269,283,000	290,388,000	+ 21,105,000
First 11 *months*	602,516,000	604,632,000	+ 2,116,000

Increased Export Subsidisation

Most groups of chemicals responded to the increased export subsidisation by notable trade gains in the second half-year, but coal-tar and derivatives; waxes, soaps, glycerine and dyestuffs, made the least progress and for the entire first 11 months were still under the 1934 value levels. Although total tonnage of dyestuffs shipments was well maintained, 30,319 compared with 30,363 metric tons, total value contracted considerably, to 118,074,000 from 140,549,000 marks.

Heavy chemicals improved considerably in the second half-year, recovering earlier losses and bringing total value figures for the entire 11 months period well ahead of the parallel 1934 period, 231,145,000 compared with 221,347,000 marks, volume rising more sharply, 2,868,221 compared with 2,567,987 tons. Under this heading are nitrogenous fertilisers, which gained notably, 613,265 tons compared with 485,320 tons, reflecting the improved international nitrogen trade attributed partly to the new International Nitrogen Cartel becoming effective on July 1, 1935. Potash fertiliser sales also increased considerably, 953,562 tons, compared with 876,118 tons, probably reflecting the beneficial effects of the marketing agreement concluded in May, 1935, with Spanish producers.

Paints and pigments were well maintained. Exports of ready-mixed paints advanced to 3,411 from 3,132 tons. Shipments of pigments were 10 per cent. above 1934 in volume, with only a slight gain in value.

Medicinals continued the strongest of all the different statistical chemical groups, total value of the exports of the two leading medicinal groups advancing still further to 84,410,000 from 81,591,000 marks, in the first 11 months period, respectively.

Considerable shifts occurred in the relative distribution of the exports, characterised by losses in the industrialised nations of western Europe and a much better showing in overseas countries serving as sources of raw materials, payment for imports of which Germany was able to make under compensatory trade agreements by means of deliveries of chemicals and other manufactures. In western European countries, however, such agreements were impracticable and direct sales were hindered by the high German price level, counteracted to some extent in the second half-year by the larger export subsidies.

Considering the difficulties of foreign trade competition, high costs and insufficient supplies of imported raw materials confronting the German chemical industry, German chemical producers made a creditable showing in 1935. Total chemical production, measured by fuel consumption, expanded around 20 per cent. However, earnings of chemical companies did not improve correspondingly, owing to the high and increasing production costs, strict control of domestic prices and foreign competition, rendering impossible any commensurate profit gain.

Export sales were maintained through the more effective export subsidisation system, but this has serious drawbacks, especially for companies catering largely to the domestic market, since producers are obliged to make financial contributions to the national subsidy fund, of from 7 per cent. of the value of their output destined to domestic sale, without the possibility of their increasing domestic prices to absorb the increased production cost. Indications are that the general run of German chemical companies, despite notably increased sales in 1935, achieved little if any increase in profit and that, with the rising production costs, net profits were maintained largely through decreases in depreciation charges.

United States Copper Industry

Advance Statistics for 1935

PRELIMINARY statistics covering copper production, foreign trade, prices and smelter and refinery stocks in 1935 indicate marked improvement over 1933-34 in certain phases of the copper industry. Smelter production from domestic ores increased 53 per cent. over 1934 and the estimated output for December was 60 per cent. higher than the average for the 11 preceding months. Production of primary refined copper from domestic and foreign sources showed a gain of 33 per cent. over 1934 and the proportion of foreign to domestic copper in United States refinery output declined in 1935. Imports of copper, principally for smelting, refining and export, increased somewhat in 1935, but the quantity earmarked for consumption in the United States was no larger than in 1934 and final figures will probably show a slight decrease.

Stocks of refined copper at refineries in the United States were 31 per cent. less than at the end of 1934, while stocks of blister and unrefined copper at smelters, in transit to refineries and at refineries are estimated to have remained unchanged during the year. Total inventories of refined and unrefined copper at the end of 1935 were only 56 per cent. of the record stocks on hand at the end of 1932. Indicated domestic consumption of copper increased 32 per cent. over 1934 and was equal to 55 per cent. of the average annual consumption in 1925-29. The average price for copper was slightly higher in 1935 than in 1934.

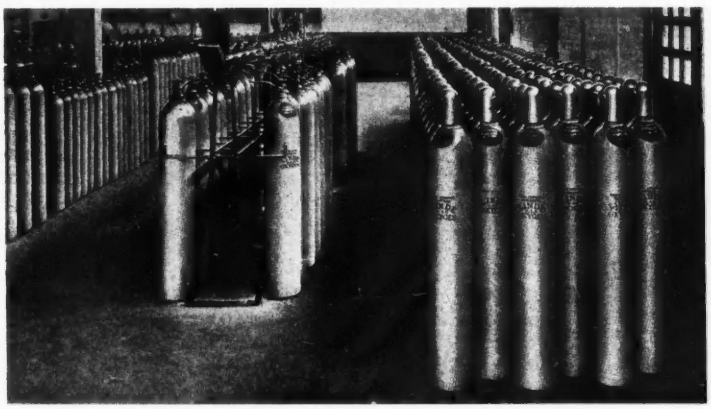
The smelter production of copper from domestic ores in 1935 as determined by the Bureau of Mines from reports of the smelters showing actual production for eleven months and estimated production for December was 746,000,000 lb., an increase of 53 per cent. over the output of 488,454,107 lb. in 1934.

Handling and Storage of Compressed Gas Cylinders

All Users Should be " Cylinder Conscious "

GAS cylinders constitute a special class of storage container on account of their singular use. They are made of special high quality steels compounded to have characteristics that are essential for the type of service to which they are subjected. They must withstand all conditions due to internal pressure and the physical and chemical characteristics of the gas. They must also withstand all normal handling and use, and unfortunately some unnecessary abuses.

It is easily understood that compressed gas cylinders could not be designed to serve every kind of use for which their convenient size and shape often recommends them. For instance, owners have at times found thoughtless people using gas cylinders for rollers as a convenient means for moving heavy objects. Obviously it would be impossible to construct these containers to withstand such abuses without excessively increasing their weight, cost of production, transportation and every other item incident to the overhead of supplying gas to the consumer.



Precise Control is important in the Cylinder Store.

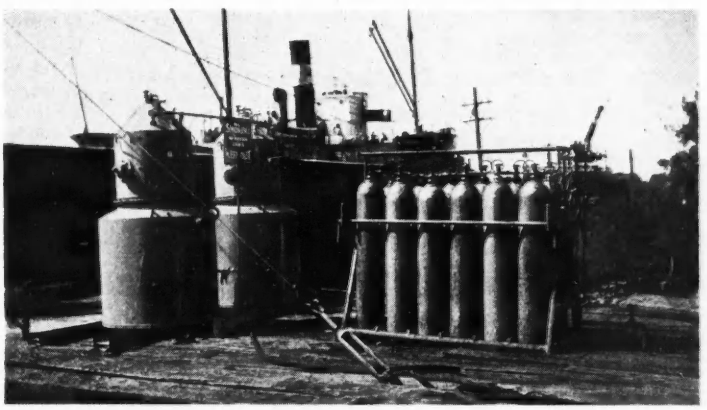
Compressed gas cylinders are safe and convenient packages for the purposes for which they are intended, said Mr. F. R. Featherstone, secretary of the Compressed Gas Manufacturers' Association, New York, when reading a paper before the 36th annual convention of the International Acetylene Association at Cleveland in November, 1935. Their owners, in the United States, are responsible to Federal authorities for proper maintenance, inspection and testing at stated periods. At the time of its manufacture and on being approved for service, each gas cylinder is recorded with the responsible Federal agency and is stamped with the required identification markings. The life record of each cylinder is completely dependent upon preservation of these identifying characters. Throughout its entire service life, therefore, its record must be maintained. Users can co-operate with the cylinder owners by taking precautions to avoid any action which would tend to mutilate these markings, whether they be stamped in the cylinder wall or attached to the cylinder on a name plate.

Each company depends upon these markings also as a means of identifying its property. Very often cylinders are found by gas manufacturers and by users which bear markings that they cannot interpret. For that reason the Compressed Gas Manufacturers' Association in the United States maintains a rather complete record of all cylinder identification markings. These records are used by the railroads and other public carriers throughout the entire United States and the Dominion of Canada. They are a source of information for determining ownership and subsequent disposition of cylinders that are not accompanied by shipping orders or are not properly tagged.

All users of compressed gases ought to be " cylinder conscious." Not only the employees who handle the cylinders but those who are responsible for the purchasing, inventories, distribution, safety practices and insurance should make it a definite part of their routine to see that this property, which is loaned to the gas consumer, is properly handled and stored while in their care. The remarks that follow are intended to suggest some of the more important recommendations concerning the handling and storage of oxygen and acetylene cylinders. They also attempt some suggestions concerning proper control of cylinders while in the user's possession. The term " control " is used in the sense of proper care, proper use, and proper limitation of the quantity of cylinders borrowed in relation to the user's actual requirements.

One of the first rules for the proper handling of compressed gas cylinders is to prevent their being dropped or striking each other violently. This general precaution, if kept well in mind, suggests other practices which should be avoided, such as the lifting of gas cylinders with a magnet, or moving them from place to place by means of a rope or chain sling. While in portable service they should be conveyed by a suitable truck or securely fastened to a safe cradle or platform. They should be kept far enough away from actual operations so that sparks, hot slag, or flame cannot possibly reach them.

When operations are conducted in confined or cramped quarters it is always preferable to have the cylinders placed a reasonable distance away. The use of extra hose will make this possible. In such cases the attendant should be near the cylinders to shut off the valves if an emergency arises.



Suitable Racks are advisable for Unprotected Manifolded Cylinders.

All users of oxygen should be aware of the violent reaction of high pressure oxygen with oils and greases. For this reason one should never permit the handling of cylinders or apparatus with oily hands or gloves nor allow oil or grease directly or oily waste or rags to come in contact with oxygen cylinders, valves, regulators, gauges or other fittings.

It is recommended that gas cylinders be stored inside of suitable ventilated buildings. They should be kept away

from radiators or other sources of heat; also protected from moisture and accumulations of ice or snow. Oxygen is not a flammable gas but is a supporter of combustion. Therefore, oxygen cylinders should not be stored near flammable material, especially oil, grease or other substance likely to cause or accelerate a fire.

When storing gas cylinders be sure that they are well protected from possible damage by falling or passing objects. It is a good rule to avoid storing or leaving cylinders in out of the way places; not only may they be lost, but other materials may become piled about them, easily causing an unnecessary fire hazard. Acetylene cylinders should always be stored and used with the valve end up; they should not be allowed to rest on their sides.

The storekeeper, or individual in charge of full cylinders, should, wherever practicable, release a full cylinder only upon the return of an empty one by the operating department. When operations are sizable, a simple internal record of movements by departments on a quantity basis is of immeasurable benefit. The storekeeper and purchasing department will find such a record invaluable. Many users specifically control the transfers of cylinders from point to point through such records to see that all cylinders when empty are returned promptly to the supplier, to prevent loss and to fix responsibility for damage which may occur if proper care is not exercised.

Cylinders held in reserve for emergency or infrequent use at isolated points should be inspected at reasonable intervals to see that no damage has occurred to the cylinders and that the cylinders contain an adequate supply of gas. If at any time a cylinder shows signs of being damaged, or gives evidence of leakage at valve or safety device, return it to the supplier with an explanation so that a special inspection may be made.

Atmospheric Pollution

Condition of Affairs not Improving

THE general cleanness of our atmosphere is not improving, for the latest figures published show a setback when compared with those of the last three years. This somewhat disturbing conclusion is reached in the 21st report of the Investigation of Atmospheric Pollution issued by the Department of Scientific and Industrial Research (H.M. Stationery Office, 5s. net).

The report contains an analysis of observations made during the twelve months ended March 31, 1935, by the seventy-eight bodies, most of which are municipal authorities, co-operating with the Department in this work. The greater part of the data presented have been obtained in the 98 deposit gauges, maintained by the co-operating bodies, but in assessing the general state of atmospheric pollution only results are used from a group of 57 stations for which the year's data can be compared with the general average of pollution for the five years 1927-1932.

More Tar and Sulphates in London

As in previous years, the data from the deposit gauges gives an estimate for the amount of total solids deposited, arrived at from the following items—tar, other carbonaceous material, including soot and organic dust blown up from the ground, insoluble ash—including mineral dust carried by the wind from road surfaces, etc. These items are grouped as "insoluble in rain." The other items which are grouped as soluble include "soluble loss on ignition" representing combustible organic material, volatile products, such as carbon dioxide, ammonium salts, sulphuric acid, etc., and the remainder expressed as soluble ash. Figures for sulphates, chlorine and ammonia, although included in the above, are also shown separately. The tables in the report giving details of these deposits show an increase in the deposit of both tar and sulphates at London, Castleford, Glasgow and Newcastle-on-Tyne. The only stations which show a consistent reduction in all the components of deposit during the current year are London, Glasgow, Rothamsted, Salford and Wakefield.

The report points out that "the fact that the deposits for a particular town are higher than the average by no means necessarily implies that proper steps are not being taken to deal with the local problems of pollution, nor does the fact that the deposit gauge results in one town are higher than in another necessarily mean that the atmosphere of the first town is more heavily polluted. It is in fact quite as probable that the town in question is making a serious effort to arrive at the real measure of local pollution by placing its gauges in positions where the deposits recorded would be likely to be heaviest. In that case the very real assistance given to this co-operative investigation by the locality in question becomes a matter for appreciative comment.

Twenty Years' Observations

The completion of twenty years' observations on atmospheric pollution has been made the occasion for a statistical examination of the records obtained from the deposit gauges This examination, which deals particularly with the records of London and Glasgow, was made by Mr. B. H. Wilsdon—until lately superintendent of the Building Research Station—and has brought to light a number of interesting points. It has established, for example, a remarkable difference in the seasonal variations of the soluble and insoluble constituents of the deposits. Whereas the deposits of soluble matter fall to a minimum in the months of April, May and June, insoluble matter is at a maximum during these months. The general trend of the results confirms the conclusion that the level of deposited impurity is as great as ever. As regards the insoluble component there is no foundation for the belief that there has been a progressive improvement during any part of the twenty years. In connection with soluble component the figures indicate an improvement during the first eight years of the period. This, it is suggested, may be due to the burning of a lower quality of domestic coal during the war years followed by a marked improvement during the post-war period. Other changes, such as a rapid spread of bituminous material on roads, may also have taken place.

Further Experiments

A point which the analysis brings out very clearly is that a considerable proportion of the soluble deposits are brought into the gauges only when it rains. This raises the question of whether matter soluble in rain is actually contained in the rain cloud, and perhaps transported considerable distances with it, or whether it is washed out of the atmosphere as the rain falls through it.

It is stated that further investigations are necessary to settle this and other points raised by the survey and the research committee is putting these in hand. In particular experiments are being made to determine the change which may occur in the deposits brought down by rain, in different intervals of time, during a shower. Sheltered and unsheltered gauges are also being used to find out how far the deposits represent the actual pollution in the locality itself. It is also proposed to make a comparison of the insoluble deposits collected in towns, on the one hand, and in country districts, on the other.

Heat Saving in a Tar Works

By ROBERT G. W. EADIE, B.Sc., F.I.C.*

COKE breeze arrives at the boiler plant at Provan Chemical Works, Glasgow Corporation, by rail, is tipped by a Babcock and Wilcox rotary tippler into an underground reinforced concrete hopper, from which it emerges on to a tray conveyor. From the tray conveyor, the fuel is carried and distributed to brick lined hoppers above the boilers by means of a bucket elevator. It then passes to the mechanical grates of the boiler furnaces through rubber lined chutes. There are six mechanical stokers, four of the Babcock and Wilcox chain grate type, electrically driven, and two Underfeed stokers, steam driven.

There are only five boilers, but No. 1 has twin stokers. The fuel ash passes over dumping bars at the back of each grate into ash hoppers. From these hoppers the ashes are discharged by gravity into a bogey which is pushed by hand on to a hoist. This hoist lifts the ashes to another hopper above ground from which rail or road wagons may be loaded. There is no smoky flame or soot associated with the combustion of the fuel, but each boiler is fitted with Diamond soot blowers to remove fine dust carried up by the products of combustion. Otherwise this dust may cause nesting on the water tubes. This dust also separates to some extent in the flues of the individual boilers, and in the main back flue. It is mainly removed, however, at the foot of the chimney by a Davidson dust arrestor.

Air for Combustion

The air for combustion is forced in by means of a Howden turbine driven forced draught fan. As it leaves the fan its temperature is raised immediately to somewhere of the order of 300-350° F. Negretti and Zambra recording thermometers register this temperature. This rapid increase in temperature is effected by contact with the hot rotating metallic elements of a Howden Ljungstrom heat interchanger. These corrugated metallic elements have become hot in the other half of each revolution of the heat interchanger by direct contact with the flue gases, as they make their exit from the plant to the chimney. On leaving the heat interchanger the air passes to an underground air tunnel which runs directly underneath the front of each stoker.

Branches from this tunnel conduct the air to the control valves situated at various points below the moving grates. Each branch has a gauge giving the air pressure. In the largest boiler the flow of gaseous products of combustion, including excess air, is measured in the main combustion space above the furnace. This is done by a Bailey Meter, which graphs the measurement on the same chart as records the steam evaporated from that boiler. Once optimum conditions of combustion have been obtained in this boiler from a test run, the Bailey meter chart is set to give coincident lines for steam and gas flow. Thereafter if these lines are kept coincident a close approximation to the conditions of the test run prevails for all rates of evaporation within the normal steaming capacity of the boiler.

Control Instruments

As the products of combustion leave the boiler flues they pass draught gauges and a Siemens electric CO_2 recorder and then make their way by the main flue to the Howden Ljungstrom heat interchanger. The temperature entering the heat interchanger is recorded on a Negretti and Zambra thermometer chart and varies very little above or below 450° F. The exit temperature from the apparatus is normally under 300° F. Beyond the heat interchanger an electrically driven induced draught fan draws the gases away to the chimney and dust arrestor. It also maintains the balanced draught condition necessary in the whole system.

Glasgow main water supply is used in the boiler plant without pre-treatment and this is supplemented by a considerable quantity of condensed steam recovered from the turbine driving the forced draught fan and from one of the larger steam consuming units in the works. The feed water is pre-heated in feed tanks by exhaust steam from the feed water pumps. It then passes through a Glenfield and Kennedy hot water meter as it flows to the suction of Weir feed pumps. On the the pressure side of the pumps the water is pre-heated in a Weir multiflow feed water heater to a temperature of 180 to 190° F.—again recorded by a thermometer. From this pre-heater the water passes to the boilers through feed water regulators. Three types of regulators, "Cope's," "Crosby," and " Weir's," are fitted to different boilers.

Working Steam Pressure

The working steam pressure is 130 lb. per sq. in. and the steam on the average has about 130° F. of superheat. These conditions are maintained almost invariably, the fluctuations in load being taken up by a Ruths steam accumulator which has a storage capacity of 10,000 lb. at 120 lb. per sq. inch. This vessel is set to supply steam at 30 lb. per sq. inch through a Ruth oil-operated automatic reducing valve. There are thus two main steam lines in the works, one at 130 lb. per sq. inch, and one at 30 lb. per sq. inch. In addition to these, there are a further two exhaust steam lines collecting steam from pumps and engines at about 10 lb. pressure; in one case serving ammonia stills, and in the second case heating refined tar and bitumen tar compound storage tanks. All steam pipes are lagged, and four electroflo steam meters operate at points convenient for control of consumption. Their measurements, incidentally, are a useful guide for steam costs allocation.

The control of the plant is through the works chemical laboratory, and a monthly heat balance is worked out on the basis of average samples of fuel taken daily. The figures in Table 1 (see page 280) are averages taken over four years by reference to all monthly reports, and cover all periods of emergency when all or part of the plant has had to be shut down for alterations or repairs. The heat efficiency is calculated on data recorded to a large extent automatically, and by the most reliable methods known to us. Moreover, the methods of testing have not been changed. Any possible errors which might be associated with the determinations should not also be associated with the differences showing up between the old and new plant operations.

Oil Washing Plant

In the oil washing plant, the handling of caustic alkali solutions has to be planned to suit the requirements of a continuous causticising plant manufacturing 20,000 gal. of 8 per cent. caustic soda solution per day. This caustic soda is used to dissolve out phenols from coal tar oils and the solutions obtained is ultimately decomposed with CO_2 gas, to liberate the phenolic extract and to regenerate at the same time sodium carbonate solution for recausticising. Constant dilution by wash water is going on in the causticising plant at a point immediately prior to the disposal of the calcium carbonate precipitate from the usual lime soda-ash reaction. The interdependence of the oil washing process and the causticising process makes it necessary that somewhere in the system evaporation should take place to make up for this dilution.

For many reasons peculiar to the process the evaporation is carried out on the alkaline solution of coal tar phenols. A triple effect evaporator is used. Liquors entering the first effect are passed through a heat exchanger where they are pre-heated by the vapours leaving the evaporator, on their way

*From a paper read before the British Association of Chemists, at Glasgow, November 22, 1935.

TABLE I.

STEAM BOILER PLANT—AVERAGE OF 12 MONTHLY FIGURES IN EACH YEAR

Year.	Calorific Value of Fuel B.T.hU./lb.		Feed Water Temperature.	Temperature of gases to Chimney.	Temperature of of air Furnaces.	Pounds of Water Evaporated per lb. fuel from and at 212°F.	Heat Efficiency. %	Items of works Cost Sheet per 1,000 gal. water evaporated.			
	Dry.	Wet.	°F.	°F.	°F.			*Fuel.*	*Water.*	*Electricity.*	*Labour.*
1931	12,157	10,226	127	460	Atmospheric	6.21	59	6/0½d.	5½d.	4¼d.	2/4½d.
1932	12,139	10,203	124	460	Atmospheric	6.72	63.8	5/5½d. (5/1¼d.)	5½d.	4d.	2/4½d.
1933	Alterations to Boiler Plant.										
1934	12,181	10,635	158	268	307.5	8.33	76	3/8d. (4/5d.)	6¾d.	5¼d.	1/2¾d.
1935	12,173	10,185	180	297	336	7.92	76	4/2d. (4/6½d.)	7¼d.	4½d.	1/3½d.
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

Column 1 shows very constant calorific values of the fine coke breeze.
Column 2 shows higher feed water temperatures in last two years 1934,1935.
Column 3 shows reduced heat losses to the chimney following the introduction of the Howden Ljungstrom Preheater.
Column 4 shows the corresponding increase in air temperatures.
Column 5 shows the improvement in evaporation of water per lb. of fuel.
Column 7 shows the fuel cost for each year per 1,000 gal. water evaporated. The figures appearing first are the actual costs; the figures in brackets for 1932,1934, and 1935 are calculated to the same price of fuel basis as prevailed in 1931.
Column 9 shows electricity cost going up with the introduction of electrically driven fuel handling plant. (This increase is offset to some extent by the supply in later years at cheaper rates.)

to a jet condenser. Exhaust steam from the pump withdrawing evaporated liquors, and from the engine driving the vacuum pump, is utilised for heating purposes in the first effect steam chamber. This exhaust supply is supplemented by steam from the 30 lb. main of the Ruth accumulator. It is at this point on the 30 lb. main that one of the four Electroflo meters forms a useful air to control.

The word "distillation," as applied to the physical process used by the tar distiller, means almost invariably fractional distillation. Fractional distillation differs from simple evaporation in many respects. The time honoured fraction indicating thermal efficiency cannot readily be calculated for processes of fractional distillation. There are no tables corresponding to Callender's steam tables giving thermodynamic constants of the products being evaporised; in fact, it is difficult to obtain from literature reliable information about even the simplest of heat values, but the following figures can be used for purposes of rough calculation.

LATENT HEATS OF VAPORISATION.

Benzene	94 calories per gm.
The mean value of total range of vapours from heavy creosote	75 calories per gm.

In the creosote range of boiling points the latent heat appears to increase with the boiling point. The highest value obtained was 103 cals. per gm. for a range 306°C. to 324°C. (of boiling point). The mean value obtained for cresylic acid vapours was 128 cals. per gm.

SPECIFIC HEATS OF LIQUIDS.

Benzene	0.416
Dalmarnock dehydrated tar	0.50
Dalmarnock heavy creosote (1.060)	0.45
Provan creosote fraction 247-297°C.	0.47
,, 306-324°C.	0.46
Cresylic Acid (pale 97/99)	0.43

Fractional Distillation

In fractional distillation heat energy must be expended over and over again upon the mixtures under treatment in order that separation or partial separation may be effected. This is done either by repeated recharging of liquid mixtures to a simple still or through the agency of the more elaborate and more modern fractionating column. To say that a fractionating column is "modern" is perhaps wrong, for even in the far back age of "achemy" they were used and the refiner's fire was applied over and over again in the hope that some miracle-working extract might be obtained which would have all its virtues concentrated in small bulk.

Before any heat requirement figure can be set for a distillation process, it is necessary to have a knowledge of the degree of separation being asked and of the particular design of plant under consideration. From general experience over years of operating and in some cases from specific tests, it has been possible to set bogey figures for heat consumption on most of the distillation plant at Provan Chemical Works. These bogey figures are used as a standard basis of comparison when scrutinising the monthly records for all plant operations.

Crude tar is normally stored in large tanks (from half to three quarter million gal. capacity) for a period sufficient to ensure a maximum separation of ammoniacal liquor to the surface layer. Formerly these tanks were fitted internally with large steam coils and, prior to drawing off for distillation, the whole body of crude tar was heated so that a rapid flow could be ensured. The steam consumption with this arrangement was heavy and, moreover, had to be continued for long periods, so long in fact as crude tar was being taken from any one particular store. To-day no internal steam coils are used in these stores. The tank is fitted externally with a small steam calorifier of length 7 ft. 6 in. and 3 ft. 0 in. diameter. The outlet valve from the main store opens directly into the bottom of the calorifier and sufficient heat is transferred in the short travel upwards through the nest of steam tubes to give the required ease and speed of handling.

The Wikner Dehydrator

Crude tar from such a storage tank is fed at Provan Chemical Works to a Wikner dehydrator, which is a fine example of a distillation apparatus in which heat losses are reduced to a minimum.

Designed for 100 tons per day, 6-7 per cent. water, its essential features are:—

Length	30 feet.
Diameter	8 feet.

Ten 2 in. steam coils (hairpin formation)
Seven 3 in. condensing coils.
Constant head overflow device.

The dehydrated tar from this Wikner dehydrator is charged through pre-heaters to intermittent stills. The charge for each still is normally 17 tons. The furnace of each still is of the pressure type fitted with Meldrum blowers and, as already mentioned, the fuel is coke breeze. The vapours from each still pass first through coils immersed in the pre-heater, and then to water condensers. In this way, when working to pitch, a preliminary distillation is set up in the pre-heater which has its own water condenser and separate distillate receiver.

The advantages as a result of introducing the Wikner tar dehydrator may be grouped under three headings:—

(1) *The total elimination of frothing or priming.*—Formerly, when working crude tar in the pre-heater of each still, the distillation in the still was not long commenced before the pre-heater started to prime. In some cases this frothing effect was sufficiently violent to blow the safety valves. Further, the tar in the pre-heater was generally not

fully dehydrated by the time the distillation in the still was finished. This gave rise to difficulties when charging the contents of the pre-heater into the hot still. For example, the usual dip method of finding when the still was fully charged gave misleading results owing to surface froth. Also, when the firing commenced on the fresh charge it had to be nursed carefully in case the still should boil over. With dehydrated tar from the Wikner this frothing is entirely absent and, as a result, it is possible to work with larger charges in each still.

(2) *The saving of time in distillation.*—It is possible with dehydrated tar to run each still through in just over 50 per cent. of the time required for each run with crude tar.

(3) *The saving of Fuel.*—When working the stills to a refined tar residue of the type required for making British standard road tars and bitumen tar compounds, the former fuel requirement averaged 1.02 cwt. per ton, but to-day's figures average 0.75 cwt. per ton. When working the stills to pitch, the former fuel requirement averaged 1.84 cwt. per ton, but to-day's figures average 1.13 cwt. per ton.

Steam Consumption

Against these figures one must set the steam consumption on the Wikner dehydrator. This averages very closely 50 lb. of steam for every 1 per cent. of water in each ton of crude tar. In other words, working crude tar at, say, 3 per cent. water content, the steam consumption per ton of tar dehydrated is approximately 150 lb. When this is computed in terms of fuel used to generate that steam at the steam boilers it represents $\frac{150}{7}$ lb. of fuel = 21.4 lb. or 0.19 cwt. per ton of tar distilled. If this figure is added to the fuel consumption at the stills working on dehydrated tar it still shows a saving on the former practice.

It may be wondered why a continuous process for the distillation of large volumes of crude tar has not been adopted. many such processes claim to give low fuel consumptions on the grounds that the continuity of the action allows greater opportunity for transfer of heat from hot products leaving the system to cold products entering. There are, however, certain good reasons for clinging to the semi-intermittent process. Firstly, it is doubtful whether over long periods of survey, a continuous process can beat the system already outlined on heat saving grounds. Secondly, there is the fact that continuous plants give maximum heat efficiency under the standard conditions for which they were designed, and any departure from these conditions, say, to obtain a different class of pitch residue or different qualities of distillates, may lead to considerable heat losses. Lastly, and perhaps the most important factor of all, continuous plants will only show heat economy if kept working. Starting up and shutting down is expensive. Moreover, the chief product of crude tar distillation in this locality to-day is refined tar for road making, and refined tar cannot be stored ready for sale without the expenditure of heat to maintain it in a fluid condition. Large stocks are therefore to be avoided, and this cannot be done without freedom to start up or shut down the distillation plant at short notice.

Phenols in Effluent Liquors

Phenols present in effluent liquors from sulphate of ammonia and ammonia plants are an objectionable factor at the sewage disposal works of the Glasgow Corporation. The dephenolating plant recently erected at Provan Chemical Works was introduced primarily with a view to curing, or at least ameliorating this chemical works effluent nuisance.

The process depends for its action upon the superiority of benzol over ammoniacal liquors as a solvent for phenols and their homologues. Once the plant is in operation, the main items of cost are (1) steam, and (2) replenishing supplies of benzol. The two Weir pumps, one for liquor and one for benzol, maintain a constant level in the feed tanks situated above the whole plant; thereafter all flow is by gravitation. The exhaust steam from the pumps, together with a similar exhaust from the pump forcing the dephenolated liquor to the sulphate of ammonia plant, is passed through coils in the liquor pre-heater. This is sufficient to raise the temperature of 70,000 gal. of ammonia liquor, per day, through about 6 to 7° C. In the same pre-heater there is an auxiliary coil for steam coming direct from the main. Both are required as a rule to bring the liquor to 50° C., the optimum temperature for the solvent extraction in the washer. On certain occasions, however, when ammonia liquor is arriving hot from the gas works, it is found unnecessary to use the main steam.

The Benzol Stills

The benzol, containing phenols in solution, leaves the washer at a temperature in the region of 40° C. and is pre-heated to 65° C. in the benzol pre-heater before it reaches the stills. This increase in temperature is effected by the vapour of benzol leaving the stills en route for the water condensers. The benzol stills and fractionating columns are thoroughly lagged, as are also all pipes carrying hot fluids. The steam coils in the stills are arranged to give rapid heat transfer for over 40,000 gal. per day of benzol which have to be distilled, although there may actually be only about 4,000 to 5.000 gal. of benzol in the circuit at any one time.

The still is D-shaped in section and the steam coils are arranged in hairpin bends along the bottom. A sectional view of the coils themselves is very similar to that of the coils in the Wikner tar dehydrator. The flow of benzol is baffled so that in passing from one side of the still to the other it has to follow the length of each hairpin back and forward until it finally reaches the outlet leading to the phenol still. Gauge glasses on the still allow the level of benzol to be kept below the baffles. There are nine hairpin coils, the first six of which are served with low pressure steam (30 lb.) and the last three with high pressure steam (120 lb.). The high pressure steam at the far side of the still is necessary in order to rid the phenols of the maximum amount of benzol, before passing them on to the phenol stills for final stripping. The entire condensate from these coils passes through steam traps to a hot well from which the water is pumped direct to water feed tanks at the steam boilers.

Pressure Gauges and Thermometers

In the benzol still house there is an instrument panel for control purposes, or rather as a guide to the quick determination of conditions on the plant. There is really very little control required. The panel includes three recording thermometers, two steam meters for high pressure and low pressure steam and a flow meter for benzol and liquor feeds. In addition, there are numerous pressure gauges and dial thermometers at critical points in the system.

The daily benzol distilled and separated by fractionation from phenol is 44,000 gal., or 1,833 gal. per hour. Assuming benzol stock temperature is 20° C. or 68° F. and that there is no reflux effects at all from the dephlegmators of the fractionating columns, then the minimum theoretical heat requirement for this distillation per hour is :—

Sensible heat for benzol (1,833 × 10 × .85 × 162 × .416) *plus* latest heat for benzol (1,833×10×.85×167)
= 1,050,000 B.Th.U. plus 2,602,000 B.Th.U.
= 3,652,000 B.Th.U.

Against this the actual steam consumption on the whole plant per hour averages 4,700 to 5,600 lb. and is drawn approximately equally from the high pressure, 120 lb. and the low pressure 30 lb. supplies. Taking the greater of these two figures the heat actually consumed in the plant is :—

(2,800 × 1,029) B.Th.U. for the low pressure plus (2,800 × 1,053) B.Th.U. for the high pressure
= 2,880,000 + 2,948,000
= 5,828,000 B.Th.U. total consumption per hour.

This heat does the total work, including liquor pre-heating, pumping and distilling. The bulk of the heat loss, of course, is at the water condensers and, indeed, we have some difficulty in dissipating this heat before the water is re-circulated for general cooling purposes in the works.

Some Problems of Coal Utilisation

Dr. F. S. Sinnatt Discusses Research and Changes in Market Requirements

DR. F. S. SINNATT, Director of Fuel Research, Department of Scientific and Industrial Research, discussed some major problems in the utilisation of coal at a meeting of the Institution of Civil Engineers held in London on March 17. He stressed the importance in the economical use of coal, not only of improvements in the design of plant, but of the selection of the right coal for a particular purpose and its preparation by cleaning and grading into convenient sizes, and described some of the important contributions connected with these factors recently made by the Department's fuel research organisation.

Changes in Composition

Referring to the work of the coal survey of Great Britain, which is collecting information concerning the properties of coal in the seams of all the main coalfields of the country, Dr. Sinnatt said although a plant may be highly efficient with coal of suitable characteristics, use of the wrong fuel may cause great losses. One of the difficulties experienced by producers and consumers arises from the diversity of the seams in the British coalfields. The coals on the whole are extremely pure, but they not only vary in properties from seam to seam, but frequently from place to place in the same seam. For example, in a distance of 10 miles the whole character of the Nine Feet seam of South Wales changes in passing from east to west. The volatile content changes from 34 per cent. to just over 15 per cent., the ratio of carbon to hydrogen rises from 16 to 1 to over 21 to 1 and the yield of tar by low-temperature carbonisation falls from 12½ per cent. to 2½ per cent. When such rapid changes in composition occur, co-ordinated information is essential to the collieries if they are to market coal of uniform quality.

Although the dull and bright coals have similar chemical analyses they are quite distinct in properties. The bright coal is highly caking and is used for the manufacture of coal gas and metallurgical coke, while the dull coal possesses only slight caking properties, and is used as a locomotive coal and for general steam raising. To meet these different markets the dull and bright coal are sorted out by hand picking, but, generally speaking, it is not possible to separate them when the coal is small, although a process has been described in which the coal is fractured and the larger dull coal is screened off the smaller bright coal. The smaller sizes separated from run-of-mine coal are a mixture of bright and dull, so that their properties are governed by the proportion of the two types present. It follows that coal of a similar size from different collieries may not have the same characteristics, although it is derived from the same seam. The difference in properties will not affect the efficiency of many plants, but may be important when the coal is used for carbonising or, sometimes, for raising steam.

Cleaning Fine Coal

Dr. Sinnatt also discussed recent developments in methods of cleaning of fine coal at the Fuel Research Station. One which depended on the dry-cleaning of coal by the alternate suction and application of air pressure, he thought, would probably fill a gap in the range of dry-cleaning equipment since it was applicable to coal of from ½ in. in size downwards without any pre-screening or dedusting. Under modern conditions of intensive machine mining there is an increased production of fine material, which usually contains a higher proportion of impurities than the larger coal. If these can be separated, however, the fine coal can frequently be reduced to a lower ash content than the large coal. This is one of the most difficult problems facing the coal industry. The fine coal in question is obtained during screening and dedusting, or as slurry from wet washeries. Attempts are being made to use it, when dry, as pulverised fuel and, if inexpensive methods of removing grit from the flue gases can be introduced, some of the objections to this practice will be eliminated.

Work at the Fuel Research Station had shown that in one case run-of-mine coal containing 13 per cent. of a particular size contained only 4 per cent. of that size when it reached the consumer. In another case coal breakers were producing 20 to 35 per cent. of a particular size, whereas, when the coal had been transported to the central screening plant and had passed through it, only one-half of the quantity of that size was available for sale.

This breakage of coal, Dr. Sinnatt said, is becoming of paramount importance and raises problems which must arouse the interest of all engineers. The question of the size in which coal was sold was also under examination in several of the coalfields. It seems to be generally recognised that a reduction in their number is desirable, as may well be believed when in one coalfield over one hundred different grade sizes of coal are produced by the collieries. Over a large part of the Continent eight sizes have been standardised, and this range is considered to be sufficient.

Pulverised Fuel

Referring to pulverised fuel, Dr. Sinnatt said the chief factor governing the extension of its use is the price of small coal. The cheapness of small coal and slack compared with larger coal had made it worth while for a number of large consumers to invest in grinding mills and other equipment for dealing with pulverised fuel, but the capital expenditure necessary has deterred small undertakings from turning over to pulverised fuel. Pioneers among coal distributors have sought to meet this situation by establishing central pulverising plant and undertaking its delivery to the customers in tank-wagons. It had proved difficult, however, to burn pulverised fuel with a short flame, and a large combustion chamber was necessary for complete combustion.

The grid burner, developed at the Fuel Research Station, had been used successfully to raise steam in Lancashire, and Babcock and Wilcox boilers over long periods with little supervision. If necessary, supplies of air can be preheated; this was advantageous when burning Welsh coal with only 15 per cent. volatile matter, but was not found necessary when using coals with 20 per cent. Satisfactory operation has been obtained with fuels containing from 20 per cent. to 35 per cent. volatile matter, and efficiencies of 74 per cent. have been maintained in a Lancashire boiler without a preheater or economiser.

These trials were carried out when evaporating steam at the rated load of 5,000 lb. per hour, but just recently it has been found possible at the Fuel Research Station to raise the load to 10,000 lb. of steam per hour, without the efficiency falling below 68 per cent. Indeed, as this difference can be largely attributed to a higher flue gas temperature, 835° F., instead of the 590° F. at rated load, it should be possible for a commercial installation, fitted with a larger economiser than is normal, to work at the same efficiency with 100 per cent. overload as at the rated load.

CALCIUM carbide production in Japan will be augmented with the establishment during the spring of 1936 of two electric furnaces by Daido Hiryo K. K. The company will produce 35,000 to 40,000 metric tons annually of carbide. It was planned to market 20,000 tons and consume the remainder in cyanamide manufacture.

Some Properties of Chlorinated Rubber

Resistance to Action of Acids and Alkalies

DR. J. P. BAXTER, of I.C.I. (General Chemicals), Ltd., Widnes, gave an interesting address on "Some Properties of Chlorinated Rubber" to members of the Liverpool Section of the Society of Chemical Industry, at Liverpool University, on March 20. Professor C. O. Bannister presided.

In his opening remarks, Dr. Baxter said that although chlorinated rubber had been known for a considerable time, the type which claimed special attention was that prepared in 1888 by Gladstone and Hibbert, who used chloroform. The composition of that preparation was: C, 28.32; H_2, 3.17; Cl_2, 65.18; O_2, 3.33 per cent. Chlorinated rubber was now marketed in a new improved form and was produced on the Continent and in America in addition to this country. He then described the development of the production of chlorinated rubber by the treatment of rubber solutions with chlorine and showed how it had received special attention in the last few years owing to the low price of rubber.

Constant Composition

Present-day chlorinated rubber, made in carbon tetrachloride, had a fairly constant elementary composition very similar to that given by the early workers, but usually contained a considerable proportion of residual solvent. During the course of the chlorination of rubber, substitution with the liberation of hydrochloric acid first preceded addition, but the latter at a certain stage increased very rapidly to a greater final value than substitution. It was essential that chlorination should be properly controlled, otherwise derivatives were obtained which had totally different properties, especially in being unstable and insoluble.

The present-day manufacturer followed closely the method originally proposed by Gladstone and Hibbert, but instead of chloroform, carbon tetrachloride was the usual solvent for rubber for this purpose, as it was less costly and more inert to the action of chlorine. The rubber solution normally had a concentration of 4 to 5 per cent. and the chlorination was conducted at temperatures below the boiling point of the solvent in lead-lined or other suitable vessels. During the chlorination, hydrochloric acid was evolved. At the end of the chlorination the solvent is removed by distillation, steam distillation, treatment with non-solvents, spray drying or other suitable means.

Different Grades of Viscosity

Dealing with solubility, Dr. Baxter said that chlorinated rubber was soluble in aromatic hydrocarbons and in many chlorinated hydrocarbons. It was also soluble in the higher ketones, nitrobenzene, pyridine, and linseed oil. Chlorinated rubber was insoluble in all aliphatic hydrocarbons and alcohols (methyl to amyl) glycol, glycerol, and turpentine. The solubility of chlorinated rubber in linseed oil was of special importance to the paint and varnish industry. Chlorinated rubber might confer special properties on the film owing to its resistance to caustic alkalies and acids. One of its most important properties was the viscosity of its solutions, for many of the practical applications of this substance demanded a product with a viscosity lying within fairly narrow limits. Chlorinated rubber must therefore be produced in a number of different grades of viscosity. A highly viscous solution might be readily passed through a colloid mill. Where paints and lacquers were concerned, fairly low viscosity products were preferable since a reasonable concentration of chlorinated rubber might be incorporated in a mix without the production of exceedingly high viscosities. This point was of importance if the paint and lacquer was to be sprayed.

Referring to thermo-plastic moulding, Dr. Baxter remarked that viscosity as applied to the thermo-plastic moulding of chlorinated rubber appeared to be relatively unimportant, low viscosity products moulding as well as those of high viscosity. Highly plasticised solid forms, however, appeared to be affected. Those prepared with low viscosity materials appeared to be softer than those from high viscosity products with the same degree of plasticisation.

The transparency of solutions of chlorinated rubber was of special interest to the varnish and lacquer industry, where clear films were required. The commercial grades of chlorinated rubber showed marked degrees of difference in transparency, presumably due to variation in the raw materials and methods of manufacture. All solutions of chlorinated rubber showed some degree of colour, and in this respect were inferior to those of nitro-cellulose and cellulose acetate. The commercial grades of chlorinated rubber contained much of the resins and protein originally present in the rubber, which developed colour in the finished product. If these resins were removed by precipitation of the chlorinated rubber solution by alcohol, a higher grade product was obtained which gave almost colourless solutions in benzene and other solvents.

Tensile Strength

A study of the tensile strength revealed that the maximum was from 6,000 to 7,000 lb. per sq. in., although a tensile strength of about 3,000 lb. was usual. When the tensile strength was lower, the material tended to become sticky. In regard to surface tension, up to 25 per cent. by weight there was little change in the constant itself. If the reciprocal of the surface tension was exterpolated it was seen that they were practically the same.

It had been found that unplasticised chlorinated rubber film became slightly brown on prolonged exposure to radiation from a carbon arc or from the sun. Measurements of the absorption of such film in the ultra violet region had been made and showed a high absorption. Such a high absorption in the ultra violet would be expected from a material containing so much chlorine. While the film used was essentially an experimental one and could not be taken accurately to represent chlorinated rubber as a whole, its strong ultra violet absorption certainly explained the tendency of such film to discolour on prolonged irradiation.

Chemical Properties

In regard to the chemical properties of chlorinated rubber, very little appeared to be known, as it was very inert and resistant to acids, alkalies and other reagents. In comparison with materials of similar physical properties it was definitely non-inflammable as it did not propagate flame, but only charred at the point of contact with the flame. The resistance of solid chlorinated rubber to both cold and hot water, as determined by analysis of the filtrates after prolonged treatment of different marketed brands, is shown in the following table:—

Brand.	% *Chloride removed at 20°C. 9 washings, totalling 282 hours.*	% *at 100°C. 16 washings, totalling 60 hours.*
M.	0.19	0.49
C.	0.16	0.52
G.	0.37	0.54

It is seen that in the presence of water all the products show very similar behaviour, in all cases the total loss of chlorine as hydrolysable chloride being very small.

The resistance of chlorinated rubber to hot and cold acids and alkalis was determined by a method likely to approximate in conditions to those obtaining when chlorinted rubber paints were tested, namely, in film form. Dr. Baxter gave data to show its remarkable resistance to acids and alkalies at temperatures of 60° and under. The action of petroleum ether at 40° C. was due to the removal of residual solvent from the unplaticised films. Similarly, it was probable that where the

other reagents had had a slight effect on the tensile strength of the film it had been due to attack on the solvent rather than on the chlorinated rubber. Variations in the residual solvent content were responsible also for the variations in tensile strength of the various films before the test. Where the films required plasticising, the plasticisers used should be themselves chemically resistant, hence the ester type of plasticiser, while excellent for certain purposes, was not likely to be as effective in promoting chemical resistance as the chlorinated hydrocarbon type.

The resistance of chlorinated rubber to caustic alkali might have special application to the paint and varnish industry in supplying a binding agent which would stand up to an alkaline wash. The lecturer demonstrated this with three pieces of light oak, one untreated, one treated with linseed oil and another with chlorinated rubber, resting in strong acid solution. In the first case the wood was badly attacked, in the second slightly less so, and in the case of chlorinated rubber the wood was not attacked.

Points from the Discussion

Mr. A. E. FINDLEY said he was interested in the blistering of paint, and he was wondering whether chlorinated rubber would tend towards making the paint blister more or less. His own opinion was that it would lessen that tendency. Again, when the chlorinated rubber was dissolved in linseed oil did it affect the drying properties of the oil? One would expect it to increase the drying properties, but whether it did so or not he could not say. Dealing with the point that chlorinated rubber tended to absorb ultra violet light, he asked whether that would have any effect on the rate of discoloration.

Dr. BAXTER remarked that the blistering of paint containing chlorinated rubber was a subject of very complex character, which was bound up with the conditions underneath, and he would not like to make a definite statement about its effect. It certainly would not make it any worse. He did not think it would effect the drying of linseed oil. In point of fact, it would assist the formation of film and would confer on it properties somewhere between linseed oil and chlorinated rubber. In regard to the third point relating to the effect of ultra violet light, it really did not come into play at all. These experiments were carried out on clear film where light had complete access to the film. The protein action of the material was usually sufficient to keep the film from discolouring rapidly.

Relative Costs

Mr. E. T. WILLIAMS asked what was the relative cost of making this material for packaging purposes. Would there be anything in the rubber to effect certain substances, for they had the residual products. Had the lecturer heard of a hygroscopic material being covered by this material? He supposed the difference in bulk density of the samples displayed was purely a question of manufacture. Had chlorinated rubber been used for protecting pots used in the manufacture of alkalies?

Dr. BAXTER said he could not deal with costs, as these materials were made on the laboratory scale. With regard to odour, the residual solvent was removed in this process and there was little or no odour remaining. Regarding its use for covering hygroscopic materials, it had waterproofing properties comparable to most substances of that character and, in some cases, slightly better. All the different samples of bulk density were made with a view to lightness. In regard to its use in the manufacture of alkalies, chlorinated rubber was extremely effective for resistance to chemical corrosion in the chemical works.

Refractories for Enamelling Furnaces

Fused Alumina Gaining Favour

READING a paper on "Refractories for Enamelling Muffle Furnaces" before the Institute of Vitreous Enamellers at Manchester on March 6, Mr. John Walker, A.R.S.M., B.Sc., explained that the term "refractories" in its broadest sense embraced all materials used for the construction of heat-resisting containers, and that their two chief functions were heat insulation and heat transfer. The requirements to be met in fulfilling these two functions were tabulated as (a) high refractoriness, (b) high strength hot and/or cold, (c) volume stability at high temperatures, (d) resistance to slag attack, (e) resistance to thermal stresses, (f) low or alternatively high heat capacity, (g) low or alternatively high thermal conductivity, and (h) low or alternatively high electrical conductivity.

Enamelling muffle furnaces in general, said Mr. Walker, consisted of (1) a heat generating chamber, (2) the working space, and (3) a general structure surrounding or enclosing (1) and (2). For the combustion chambers, bricks with a refractoriness of Cone 34/35 were recommended in the case of coal, gas and oil firing, though the highly volume stable fused alumina grades were stated to be necessary for the higher temperatures secured in some modern oil-fired enamelling muffle furnaces. Adequate cold strength was easy to secure, but it was explained that the strength of refractories tended to decrease with rising temperatures mainly because of the gradual softening of the glassy matrix. The hot strength of various types of firebricks was compared and the use of aluminous firebricks recommended to avoid the risk of the sudden collapse which characterised siliceous firebricks. Fused alumina bricks were shown to have an extremely high hot strength adequate for any conditions likely to be encountered in any enamelling furnace. The mechanism of slag attack was illustrated by diagrams showing the effects of inactive viscous slags, slags of medium viscosity and activity and very erosive slags. The highly resistant character of the "white line," or bleached interface, formed under certain conditions between aluminous bricks and slag coatings, was emphasised, though it was explained that, while more siliceous grades formed a less durable interface, its formation and protection was more readily secured.

Three types of spalling—thermal, physical and mechanical—were described. The high spalling resistance of a special fireclay was explained as being due to its unusually low reversible expansion and high elasticity. Silicon carbide bricks were recommended for those positions where clinkering occurred and subsequent stripping led to mechanical damage. This material was said to be highly non-clinkering and also to be unusually hard and strong. The use of fused alumina or silicon carbide panel bricks for the muffle shell was said to lead to fuel economy and increased output on account of the high thermal conductivity of these two materials. The former material was said to be gaining favour on account of its complete volume stability. Silicon carbide, while more highly conductive, was liable to oxidation, growth and distortion under strongly oxidising conditions, particularly between 800° C. and 1,000° C. In furnaces operating at somewhat lower temperatures long service was frequently secured.

Lastly it was explained that the use of modern high temperature insulating bricks had led to rapid heating, and fuel economy through decreased radiation and heat storage losses. The widest use of such bricks was possible in furnaces with clean gas or electrical heating, but with ash bearing fuels protection by a minimum thickness of refractory was necessary to avoid unduly rapid slag attack.

Acknowledgment was made to the directors of the Morgan Crucible Co., Ltd., for permission to publish this information.

Very Low Temperatures

A Series of Lectures at the Science Museum

In connection with the Exhibition of Very Low Temperatures at present on view in the Science Museum, South Kensington, a series of lectures will be delivered in the lecture theatre at the Museum as follows:—April 1, "The Development and Uses of Low Temperature Technique," by Professor M. W. Travers, D.Sc., F.R.S.; April 22, "Industrial Uses of Low Temperatures: Oxygen," by C. G. Bainbridge, A.M.I.Mech.E.; April 29, "Industrial Uses of Low Temperatures: the Rare Gases," by J. T. Randall, M.Sc.; May 6, "Industrial Uses of Low Temperatures: Solid Carbon Dioxide," by I. J. Faulkner, Ph.D.; May 13, "The Approach to the Absolute Zero: the Liquefaction of Hydrogen and Helium," by J. D. Cockroft, Ph.D., F.Inst.P.; May 20, "The Properties of Matter at Very Low Temperatures," by Professor F. A. Lindemann, F.R.S.; May 27, "Temperatures Below 1° Absolute," by Professor F. Simon, Dr. Phil.

In each case the lectures will be on a Wednesday, and will commence at 5.15 p.m. Admission, which is free, will be by ticket only. Applications for tickets, which should state for which lecture the ticket is required, will be dealt with in the order of their receipt. As the accommodation in the lecture theatre is limited, applications should be sent as soon as possible to the Director, The Science Museum, London, S.W.7.

Monel Metal Stop Valves

Exceptional Corrosion Resisting Properties

The corrosive conditions which call for the service of such a material as Monel metal are not by any means confined to those resulting from the presence of individual chemical products; more often the metal encounters the simultaneous attack of a number of different chemicals. A typical instance is that of a Scottish chemical works, where 7 inch stop valves have to operate in an atmosphere of benzene solvent gases and watery vapours containing stearic and oleic acids, with a considerable amount of ammonia. The valves control the gas flow between extraction machines and condensers and the conditions are so severe that mild steel valve spindles, for instance, become useless in as short a period as three months. Such conditions call for a material of more than ordinary corrosion-resisting properties, and it is therefore of interest to note that Monel metal spindles, installed in these valves some fifteen years ago, are still giving satisfactory service.

A Stop Valve with Monel Metal Spindle.

Attack by stearic and oleic acids necessitates the use of Monel metal in many other directions. Filter cloth employed in soap works, mixers for the processing of polishes, heating kettles, pump rods and fittings for the production of candles or gramophone records form just a few instances. For pipe-lines and autoclaves which encounter these acids, the use of pure nickel is recommended.

British Association of Chemists

Manchester Section Annual Meeting and Dinner

The annual meeting of the Manchester Section of the British Association of Chemists was held at the Engineers Club, Manchester, on March 18. Mr. P. Chorley was in the chair and among those present were the president, Professor E. C. C. Baly, and the general secretary, Mr. C. B. Woodley.

The hon. secretary's report showed that the section had been active both in Manchester itself and in the Accrington district. A further increase in membership was reported. The hon. treasurer's report showed that the section's finances were in a satisfactory condition. The adoption of the reports was followed by the election of officers and committee for the forthcoming year. These were as follows: Chairman, Mr. P. Chorley; hon. secretary, Mr. A. Hill; hon. treasurer, Mr. L. W. Pickup; committee, Messrs. Bury, Gill, Hart, Dr. Bartlett, Dr. Anderson, Dr. Hankey, Messrs. Brightman, Keaton, Kay and Dent. The chairman welcomed the new members of the committee.

A vote of thanks to the retiring officers and committee was proposed by Mr. E. N. Marchant and supported by Mr. Woodley. Mr. Chorley responded.

Following the formal business Mr. Woodley gave an interesting statement on the subject of unemployment insurance and the contacts which had been made with the Government committee sitting under the chairmanship of Sir William Beveridge.

The annual meeting was followed by the annual dinner, at which Mr. P. Chorley presided. The guests included Professor E. C. C. Baly (president) and the following chairmen of the various chemical societies' local sections: Mr. C. J. T. Cronshaw (Institute of Chemistry), Mr. McCulloch (Society of Chemical Industry), Mr. A. Gill (Literary and Philosophical Society Chemical Section), Mr. Lawrie (Society of Dyers and Colourists). Dr. Ridway, in place of Dr. Naunton (Institute of the Rubber Industry) and Mr. Woodley were also present. Apologies for absence were received from Mr. W. E. Kay, Dr. Jolly (Oil and Colour Chemists' Association), Mr. C. S. Garland (past-president) and Mr. Woodcock (hon. treasurer). About fifty-five members and friends were present.

Professor Baly, in proposing the toast of "The Manchester Section," said that as president he could always depend upon healthy and constructive criticism from the Manchester Section on all council matters. Continuing, Professor Baly gave an informative account of recent history in connection with the Poisons Board Regulations and Report. Mr. Chorley replied on behalf of the Section.

Mr. T. O. Morgan proposed the toast of "The Guests" and gave special reasons why each individual guest was particularly welcomed. Mr. Cronshaw responded for the guests in a short but witty speech. The function concluded with a vote of thanks to the chairman, proposed by Mr. Hill.

Society of Chemical Industry

Liverpool Section Annual Meeting

AT the annual meeting of the Liverpool Section of the Society of Chemical Industry at Liverpool University, on March 20, Professor C. O. Bannister, chairman of the Section, referred to the annual meeting of the Society in July and remarked that the committees and sub-committees had commenced work and certain arrangements were being made. They hoped they would have a very good meeting. He took the opportunity of appealing for new members.

The following officers were elected for the 1936-37 session :—Chairman, Professor T. P. Hilditch; vice-chairman, Professor C. O. Bannister; hon. treasurer, Mr. A. E. Findley; hon. recorder, Dr. G. P. Gibson; hon. secretary, Mr. J. S. Towers; hon. auditors, Mr. F. Robertson Dodd and Mr. James Smith. For the four vacancies on the committee, Messrs. L. V. Cocks, E. Gabriel Jones, F. S. Thurston and W. J. South were elected, whilst Mr. Edwin Thompson took the place of Mr. C. E. Mold, who has left the district. Group representatives were appointed as follows:—Mr. W. Ramsay Sibbald (Chemical Engineering Group); Mr. E. Gabriel Jones (Food Group); Mr. B. D. W. Luff (Plastics Group); Mr. A. E. Findley (Road and Building Materials Group).

A report of the paper on "Some Properties of Chlorinated Rubber" read by Dr. J. P. Baxter, of I.C.I. (General Chemicals), Ltd., Widnes, appears in pages 289-290.

North-East Chemical Dinner

A Special Piece of Co-operation

THERE was a very representative attendance of members of the chemical industries at the annual dinner of the North-East Chemical Societies at Newcastle on March 20. Three distinguished guests were Professor N. V. Sidgwick, president of the Chemical Society; Dr. R. H. Pickard, F.R.S., president of the Institute of Chemistry; and Mr. W. A. S. Calder, president of the Society of Chemical Industry. Mr. M. A. Appleby, Billingham, presided, and in proposing the toast of "The Chemical Societies" he said the gathering was unique in that they had the heads of the three main chemical societies together at dinner. Their guests had heard a lot about co-operation and he thought he was justified in calling to their notice a special piece of co-operation on the part of chemical societies in that area. In addition to holding joint meetings they had undertaken a special effort to assist the Commissioner for Special Areas. "The idea is," he said, "to help, as far as we can, in the industrial revival of this area, now, I am glad to note, called a special and not a depressed area, the misnomer by which it was previously known."

Mr. CALDER responded to the toast and Professor SIDGWICK replied to the toast of the guests proposed by Dr. J. T. DUNN. Professor Sidgwick said there was need for leaders of the chemical industry to spend more money in research for new processes, rather than in merely developing details of processes discovered in other countries. The reason for the latter line was, he believed, due to the fact that the directors of all the great chemical industries had not sufficient chemical knowledge, and only when a process had been worked out on a really big scale were they prepared to spend the money of their companies. There was no doubt the development of detail in this country had been a great success, but he could not see why the development of new processes need be behind any other country.

Dr. PICKARD, proposing the toast of "Newcastle and the North-East Coast," said that local chemists by their initiative in drawing up the report on local industries for the Commissioner for Special Areas had shown their willingness to take part in public affairs.

Advertising and Employment

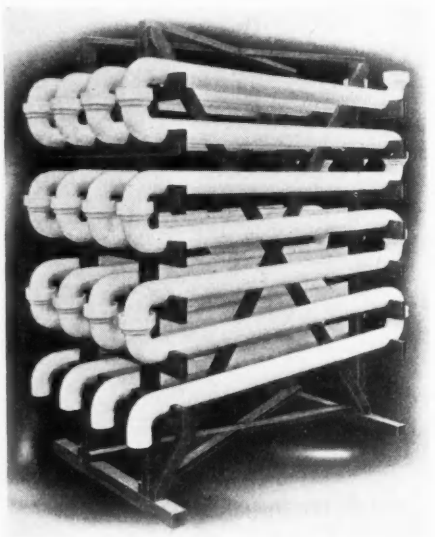
Triumph of the Business Classes

MEMBERS of the Publicity Club of Sheffield gathered in large numbers at the Grand Hotel on Tuesday to hear an after-luncheon address by Sir Ernest Benn in his capacity as president of the Advertising Association. Sir Ernest Benn said that the trade and employment in which all took pride, and which was largely the growth of the advertising idea, was to a very great extent the triumph of the business classes over political barriers and bureaucratic obstruction. "These politicians," he went on, "have made for us, as we know, a perfectly mad world, and the extraordinary thing is that they themselves are frightfully eloquent about it. We have got a political world which is struggling with the notion that you can raise the standard of living by making things dearer and having less of them."

When employment was mentioned in Parliament and other public discussions, everybody thought of a horny-handed son of toil, with his coat off. It had not yet dawned upon them—because advertising people had not done their job—that the making of an article was a comparatively simple process, compared with its distribution, and its placing in its final home with the consumer. In some products that was nine-tenths of the business, and in most products it was half. Exchange, movement, buying and selling, and eventually consumption, were the essence of the unemployment problem, and that was a matter for the advertising and publicity world.

The Advertising Association had two main objects—to educate the public in the advertising idea and create a public opinion which appreciated what advertising did, and to educate themselves, in which they were doing a great deal. The advertising stalwarts of Sheffield had the well-being of the city in their hands.

SULPHURIC acid production in France was estimated at around 900,000 metric tons during 1935. This figure represents considerably less than half of the production capacity of the French plants, whose high point in production was reached in 1919 with 1,500,000 metric tons. The decline in the production of sulphuric acid is directly attributable to the decreased consumption of superphosphate.



This Vitreosil fused silica ware cooler is constructed very simply in the form of a battery of "S" bends. It is used in the concentration of acid and was supplied by the Thermal Syndicate, Ltd.

Personal Notes

MR. JAMES RINTOUL SMELLIE, son of the managing director, has joined the board of Lubricating and Fuel Oils, Ltd.

MR. C. E. S. CHAMBERS, chairman of W. and R. Chambers, Ltd., and chairman of the Travancore Rubber Co., Ltd., Edinburgh, has died at Edinburgh. He leaves a wife, a son and a daughter.

MR. W. STEWART, B.Sc., St. Andrews, has received an appointment as a research assistant with Yorkshire Tar Distillers, Ltd., Knottingley, Yorkshire. He graduated in 1928 and was for some years in Mexico with the Eagle Oil Co. On his return to this country he took up the post-graduate course in business administration in the Dundee School of Economics and has been in attendance during the present session.

DR. E. L. BURGIN, Parliamentary Secretary to the Board of Trade, was the guest of honour at a luncheon given at Grosvenor House, Park Lane, on Tuesday by the British Plastics Federation. Other guests present were Sir William J. Larke (British Iron and Steel Federation), Mr. F. O. Barralet (G.P.O.), Mr. A. C. Bossom, M.P., Major J. S. Buchanan (Air Ministry), Mr. A. D. Constable (Director of Electrical Engineering at the Admiralty), Mr. C. Le Maistre (British Standards Institution), Professor G. T. Morgan, Major F. A. Freeth, Colonel F. Reid (G.P.O.), Lt.-Col. Stevens (American Embassy), Mr. L. B. Turner (representing Director, Chemical Defence Research Department), and Mr. C. S. Wright (Director of Scientific Research, the Admiralty).

MR. J. C. BUDD, SIR G. E. LEON, BT., MR. WILLIAM MURE and MR. WILLIAM MURRAY have been appointed directors of Amalgamated Metal.

MR. MICHAEL EDMUND STEPHENS, of Coverwood, Ewhurst, Surrey, and 74 Portland Place, Marylebone, London, W., formerly head of Henry C. Stephens, ink manufacturers, who died at Estoril, Portugal, on February 12, aged 68 years, has left estate of the gross value of £1,010,288 (net personalty £978,895).

Letter to the Editor

The Dead Sea : A Storehouse of Chemicals

SIR,—My attention has been drawn to the report published in THE CHEMICAL AGE of March 14 of the discussion on the paper on " The Dead Sea : A Storehouse of Chemicals " read by Mr. M. A. Novomeysky at the annual meeting of the Institution of Chemical Engineers, where I am reported as having stated that I had been shown some common salt from the Dead Sea containing pathogenic bacteria. What I actually said was " salt from the *Red Sea* containing *chromogenic* bacteria " which is quite another matter.—Yours faithfully,

R. F. STEWART.

Abford House,
Wilton Road, S.W.1.

Continental Chemical Notes

Sweden

MANUFACTURE OF WAX CLOTH is to be carried out in a disused match factory at Auneberg by a new company, with a capital of 1.05 million kronen, under participation of Svenska Tandsticks A. B. and the Association of Co-operative Societies.

Germany

THE FIRST HYDROGENATION PLANT of the Braunkohlen-Benzin A.-G. (Brabag) is expected to be in operation in the course of the present month, and the output will be taken over for the time by the Benzol Association of Bochum.

France

A PETITION URGING THE GOVERNMENT to enact legislation for compulsory incorporation of colophony with soaps has been received by the Trade and Industry Committee of the Chamber of Deputies.

BY DISTILLATION OF SULPHUR-CONTAINING BITUMEN SHALE, deposits of which are found at Orbangnoux, an oil suitable as an agricultural insecticide is being isolated by the Soc. Office Industrial des Substances OrganiquesSulfurées (Paris).

Italy

THE GERVAERT PHOTOGRAPHIC FACTORY, Turin, has reduced its original capital of 1 million lire to 10,000 lire.

THE FORMATION IS ANNOUNCED of S. A. Azienda Nazionale Idrogenazione Combustibili, a consortium of mining and chemical interests which proposes to engage in the manufacture of synthetic liquid fuel. One half of the issued capital will be taken up by shareholders of the Montecatini concern and the rest will be divided between " Agip " (a semi-state owned petroleum company) and " Aipa " (a petroleum firm sponsored by the Italian State Railways).

Russia

TWO NEW PROCESSES FOR MAKING ARTIFICIAL LEATHER from synthetic rubber have been developed by the Central Research Institute of the Leather Industry.

Poland

THE POLISH SCHERING-KAHLBAUM CONCERN is planning to bring resublimed iodine on to the market. Germany was formerly the principal source of this article.

Far Eastern Chemical Notes

Japan

CRYOLITE PRODUCTION at the Kizugawa factory of Teikoku Jinzohiryo K.K. is to be increased from 6 to 10 tons daily.

A NEW RUBBER-REGENERATING WORKS, with a daily capacity of 10 tons, is being built in Yokohama by Nippon Saisei Gornu K.K.

INCREASED PRODUCTION OF BARIUM SALTS, phosphorus and ferro-phosphorus has been decided upon by Nippon Seiren K.K. who are also contemplating installation of a potassium permanganate plant.

THE ACETIC ACID FACTORY of Nippon Gosei Kagaku Kogyo K.K., at Okagi, is increasing its monthly capacity to 1,000 tons, part of which will be used by the concern for making cellulose acetate.

FOLLOWING ENCOURAGING RESULTS in small scale production of glycerin from low grade rice molasses at the rate of 1,000 kilos per month, the Yamakawa Seiyaku K.K. has decided to develop the process on a large scale. The new enterprise will also have the support of Nippon Kayaku K.K. (Japanese Explosives Company).

Weekly Prices of British Chemical Products

THERE are no price changes to report in the markets for general heavy chemicals, rubber chemicals, wood distillation products, pharmaceutical and photographic chemicals, perfumery chemicals, essential oils, and intermediates. In the coal tar products section there have been reductions of one penny per gal. in the prices of commercial and pure xylol. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—Markets continue to receive an average volume of inquiry and there are no price changes to report.

MANCHESTER.—Firm price conditions obtain almost throughout the range of chemical products, and in very few instances on the Manchester market during the past week has there been any indication of weakness. Here and there sellers report a moderate volume of new contract bookings of miscellaneous chemicals for delivery over the second quarter of the year, with also a fair amount of business for prompt delivery. At the consuming end of the trade in this part of the country conditions leave relatively little room for complaint on the whole, although there is still not the quantity being taken up by the textile industries in the aggregate that there should be. In most other directions, however, delivery specifications against contracts are covering fairly satisfactory quantities. Among the by-products, both pitch and crude tar have been displaying renewed easiness, but in most other respects price conditions remain steady to firm.

SCOTLAND.—There has been a rather better demand for chemicals for home trade during the week, though export inquiries still remain very limited. Prices generally continue steady at about previous figures, lead and zinc products being very firm in sympathy with the metals. Red lead and litharge prices have been increased by £1 per ton.

General Chemicals

ACETONE.—LONDON: £62 to £65 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—40% technical, £16 12s. 6d. per ton. LONDON: Tech., 80%, £30 5s. to £32 5s. per ton; pure 80%, £32 5s. to £34 5s.; tech., 40%, £16 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £32 5s.; tech., 80%, £30 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £50.

ACID, BORIC.—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; extra finely powdered, £31; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. B.P. cryst., £36; B.P. powder, £37. SCOTLAND: Crystals, £28; powdered, £29.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. MANCHESTER: 11¾d. to 1s. SCOTLAND: 11¾d.

ACID, CRESYLIC.—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal. LONDON: 98/100%, 1s. 5d. f.o.r.; dark, 1s.

ACID, FORMIC.—LONDON: £42 to £47 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £48 10s. to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. LONDON: 11½d., less 5%. SCOTLAND: 1s. 0¼d. less 5%. MANCHESTER: 1s. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM SULPHATE.—Neutral quality, 20.6% nitrogen, £7 per ton.

ANTIMONY OXIDE.—SCOTLAND: £61 to £65 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £15 per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £21, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—5s. 3d. to 5s. 6d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¼d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 2¾d. per lb.; liquor, £19 10s. per ton d/d

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 16s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £24 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £36 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £36; brown, £35.

LEAD NITRATE.—£32 10s. to £34 10s. per ton.

LEAD, RED.—SCOTLAND: £26 to £28 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £41.

LITHOPONE.—30%, £16 5s. to £16 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PHENOL.—6¾d. to 7¼d. per lb. to June 30, 1936.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38 10s.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5¼d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8¾d. per lb. SCOTLAND: B.P. crystals, 10d. to 10½d. MANCHESTER: B.P., 11¼d. to 11½d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¼d. ex store. MANCHESTER: Yellow, 8¼d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—LONDON: £21 per ton. SCOTLAND: £20 15s.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON: 4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.

SULPHUR.—£9 5s. to £9 15s. per ton. SCOTLAND: £8 to £9.

SULPHATE OF COPPER.—MANCHESTER: £14 17s. 6d. per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 5s. 1d. per lb. in 1-cwt. lots.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—10d. to 11d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—£7 5s. per ton for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.

CALCIUM CYANAMIDE.—March, £7 3s. 9d. per ton; April/June, £7 5s., delivered in 4-ton lots.

NITRO-CHALK.—£7 5s. per ton delivered in 6-ton lots to farmer's nearest station.

NITRATE OF SODA.—£7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station.

CONCENTRATED COMPLETE FERTILISERS.—£10 10s. to £10 19s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE (N.P.) FERTILISERS.—£10 5s. to £13 15s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.

Coal Tar Products

ACID, CRESYLIC.—99/100%, 2s. 1d. to 3s. per gal., according to specification; pale 98%, 1s. 10d. to 2s.; dark, 1s. 6d. to 1s. 7d. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s 1d.; high boiling acid, 2s. 6d. to 3s.

ACID, CARBOLIC.—Crystals, 6¾d. to 7¼d. per lb.; crude, 60's, 2s. 3d. to 2s. 5d. per gal. MANCHESTER: Crystals, 7¼d. per lb.; crude, 2s. 1d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

BENZOL.—At works, crude, 8½d. to 9d. per gal.; standard motor 1s. 2d. to 1s. 2½d.; 90%, 1s. 3d. to 1s. 3½d.; pure, 1s. 7d. to 1s. 7½d. LONDON: Motor, 1s 3½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 5½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 4½d. to 5½d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4¾d.; light, 4½d.; heavy, 4¼d. to 4½d.

NAPHTHA.—Solvent, 90/100%, 1s. 5½d. to 1s. 6½d. per gal.; 95/160%, 1s. 9d.; 90%, 1s. to 1s. 2d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £17 10s. per ton; purified crystals, £24 to £25 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PYRIDINE.—90/140%, 5s. 3d. to 7s. 6d. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 2s. 3d. per gal.; pure, 2s. 7d.

XYLOL.—Commercial, 2s. 2d. per gal.; pure, 2s. 4d.

PITCH.—Medium, soft, 42s. 6d. to 43s. per ton, in bulk at makers' works. MANCHESTER: 37s. 6d. f.o.b., East Coast.

Latest Oil Prices

LONDON.—LINSEED OIL was quiet. Spot, £28 10s. per ton (small quantities); April and May-Aug., £26; Sept.-Dec., £26 5s. naked. SOYA BEAN OIL was steady. Oriental (bulk), April shipment, £21 10s. per ton. RAPE OIL was slow. Crude extracted, £34 10s. per ton; technical refined, £36, naked, ex wharf. COTTON OIL was steady. Egyptian crude, £24 10s. per ton; refined common edible, £28; and deodorised, £30, naked, ex mill (small lots £1 10s. extra).) TURPENTINE was dearer. American spot, 46s. 6d. per cwt.

HULL.—LINSEED OIL.—Spot quoted £26 5s. per ton; March, £25 15s.; April, £25 17s. 6d.; May-Aug., £26; Sept.-Dec., £26 2s. 6d. COTTON OIL.—Egyptian, crude, spot, £25 per ton; edible, refined, spot, £27 10s.; technical, spot, £27 10s.; deodorised, £29 10s., naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £23 per ton, naked. GROUNDNUT OIL.—Extracted, spot, £30 10s. per ton; deodorised, £33 10s. RAPE OIL.—Extracted, spot, £33 10s. per ton; refined, £35. SOYA OIL.—Extracted, spot, £26 per ton; deodorised, £29. COD OIL.—F.o.r. or f.a.s., 25s. per cwt., in barrels. CASTOR OIL.—Pharmaceutical, 42s. 6d. per cwt.; first, 37s. 6d.; second, 35s. 6d. TURPENTINE.—American, spot, 47s. 6d. per cwt.

New Companies Registered

Cheshire Soap Co., Ltd. Danes Moss Mill, Macclesfield.—Registered March 20. Nominal capital £2,000 in £1 shares. Manufacturers of and dealers in soap, oils, greases, oleaginous compounds, etc. Directors: Lionel W. Dillon and Enoch V. Tickle.

Coking and By-Products, Ltd.—Registered March 16. Nominal capital £500 in 5s. shares. To exploit and develop processes for carbonisation and distillation of coal and other mineral substances, and the recovery of by-products therefrom; ironmasters, steel makers and converters, colliery proprietors, manufacturers of bricks, chemicals and manures, distillers, dye and gas makers, etc. First directors: C. R. Enever (chairman), Broad Street House, E.C.2, P. F. F. Gilles, H. Hafnushaw and B. Schieldrop.

Guy Maxwell, Ltd., 8 New Court, Lincolns Inn, W.C.2.—Registered March 18. Nominal capital £100 in £1 shares. Manufacturers of and dealers in chemicals, gases, drugs, medicines, etc. Subscribers: Miss Ida H. King and Miss Winifred H. Ross.

Lane Brothers (Tar Distillers), Ltd.—Registered on March 19. Nominal capital £50,000 in £1 shares. To acquire the goodwill and assets of the businesses carried on by James R. Lane and Josiah B. Lane, as "Lane Brothers," to invest the capital and other moneys of the company in the purchase of or to lend the same upon the security of shares, stocks, debentures, debenture stocks and other securities, to carry on business as an investment lending and agency company, and that of distillers, by-product manufacturers, coke and patent fuel manufacturers, etc. Directors: James R. Lane (chairman) and Josiah B. Lane.

Vivian's Fertilisers, Ltd.—Registered March 12. Nominal capital £10,000 in £1 shares. To acquire the goodwill of the fertiliser business carried on in Cornwall and Devon by British Copper Manufacturers, Ltd., under their own names. Subscribers: Fredk. Hopton, and E. J. Alldis, 2 Bond Court, Walbrook, E.C.4.

W. J. Robson and Co. (Turpsad), Ltd., 9 Belgrave Road, S.W.1.—Registered March 19. Nominal capital £5,000 in £1 shares (2,500 6 per cent. cumulative preference and 2,500 ordinary). Manufacturers of floor, furniture, metal, boot and other polishes and creams, oil and grease merchants, paint, varnish, cellulose enamel and colour manufacturers, manufacturers of turpentine, synthetic turpentine, chemicals, etc. Directors: William J. Robson and Agnes G. Robson.

Books Received

Sulphuric Acid Manufacture. By Andrew M. Fairlie. London: Chapman and Hall, Ltd. New York: Reinhold Publishing Corporation. Pp. 670. 48s. 6d.

Insulin. By Douglas W. Hill and Frederick O. Howitt. London: Hutchinson's Scientific and Technical Publications. Pp. 219. 12s. 6d.

Perfumes, Cosmetics and Soaps. By W. A. Poucher. London: Chapman and Hall, Ltd. Pp. 440. 25s.

Soviet Science. By J. G. Crowther. London: Kegan Paul, Trench, Trubner and Co., Ltd. Pp. 342. 12s. 6d.

Phenomenes Colloidaux. By Rene Dubrisay. Paris: Librairie Armand Colin. Pp. 186. 10f.50.

Fortschritte des Chemischen Apparatewesens. Vols. 5 and 6. Leipzig: Akademische Verlagsgesellschaft m.b.H. RM. 168.

Annual Reports of the Society of Chemical Industry on the Progress of Applied Chemistry. 1935. Vol. XX. London: Society of Chemical Industry. Pp. 814.

Mining Royalties and Rents in the British Empire. The Imperial Institute, Mineral Resources Department. Pp. 184. 3s. 6d.

Phosphates and Superphosphates. Supplement No. 2 (superseding Supplement No. 1 issued in 1932). By A. N. Gray. London: The International Superphosphate Manufacturers' Association. Pp. 56. 2s.

The Structure of Metals and Alloys. By William Hume-Rothery. London: The Institute of Metals. Pp. 120. 3s. 6d.

Collected Scientific Papers of Sir William Bate Hardy. Published under the auspices of the Colloid Committee of the Faraday Society. Cambridge University Press. Pp. 922. 63s.

A Brief Course in Quantitative Analysis. By Louis J. Curtman. Macmillan and Co., Ltd. Pp. 250. 10s.

Official Publications

The Investigation of Atmospheric Pollution. Report for year ended March 31, 1935. London: H.M. Stationery Office. Pp. 103. 5s.

Air Raid Precautions Memorandum No. 2. Rescue Parties and Clearance of Debris. London: H.M. Stationery Office. Pp. 8. 2d.

Twenty-Eighth Annual Report of the Imperial College of Science and Technology. H. M. Stationery Office. Pp. 114. 2s.

Chemical and Allied Stocks and Shares

SENTIMENT in the industrial section of the Stock Exchange has continued to be dominated by the European political situation, and pending more definite developments there has been an easier tendency in evidence this week. Selling pressure is reported to have been only moderate, but in the absence of increased demand there has been a disposition for share values to make rather lower prices. Imperial Chemical have continued active on the confident belief that the dividend will be maintained at 8 per cent. The market is looking for increased profits, but believes that a large sum will again be allocated to reserve, particularly in view of the uncertainty which still attaches to the outlook for international trade. Salt Union have been better, partly on the favourable impression created by the statements at the recent meeting, and British Glues and Chemicals were more prominent, it being more generally realised that a very satisfactory dividend may be in prospect now there are no arrears of dividend on the preference shares. Blythe Colour Works 5s. ordinary shares have been active on the belief that it is possible a dividend of 20 per cent. may be in prospect. The official particulars of the company which were published earlier in the year indicated that on the basis of the last published profits earnings on the ordinary shares would be equal to 32½ per cent. Fison, Packard and Prentice have been rather dull, although hopes of a larger interim dividend persist. Goodlass Wall were steady on continued hopes that the results may show the raising of the dividend to 7½ per cent. Pinchin, Johnson continued active having remained under the influence of the good results for the past year and the raising of the dividend to 20 per cent. Lewis Berger held up relatively well and paint shares generally were firm. Lever Brothers preference shares were inclined to make higher prices, the results of the subsidiary companies, including Joseph Crosfield and William Gossage, having increased the belief that Lever's forthcoming results will again be favourable. The company's preference and preferred ordinary shares have invariably been covered by a very large margin of profits and this explains their popularity as an investment. They probably have as active a market as any other group of preference shares in the industrial list. United Premier Oil and Cake have been firm on the favourable impression created by the recently issued results. Imperial Smelting held up well on the continued favourable trend in the price of zinc and on the talk that the Zinc Cartel is likely to be revived during the next six months. Burt, Boulton and Haywood held their recent gain. Boots Pure Drug remained active, there being continued talk in the market that a bonus is likely this year. In other directions there was activity in Consett Iron, the full details of the directors' plan for reorganising the capital having created an excellent impression, particularly as it is officially stated that it should permit of the resumption of dividends in 1937. It is also officially estimated that the profits for the financial year 1935-36 will show a very good further advance. British Cyanides held up quite well. In this case there are continued hopes that an interim distribution will be made on the shares. British Drug Houses and Lawes Chemical were steady. Courtaulds remained rather dull. Associated Portland Cement were aided by the good impression created by the full report which emphasises the company's strong position. The dividend is increased to 20 per cent. Oil shares have been less active.

Name.	March 24.	March 17.
Anglo-Iranian Oil Co., Ltd. Ord.	91/10½	90/7½
,, 8% Cum. Pref.	37/3	36/3
,, 9% Cum. Pref.	38/-	37/-
Associated Dyers and Cleaners, Ltd. Ord.	**1/10½**	**1/10½**
,, 6½% Cum. Pref.	6/6¾	6/6¾
Associated Portland Cement Manufacturers, Ltd. Ord.	86/10½	86/3
,, 5½% Cum. Pref.	27/-	27/-
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	4/4½	3/9
Berger (Lewis) & Sons, Ltd. Ord.	68/9	67/6
Bleachers' Association, Ltd. Ord.	6/3	6/3
,, 5½% Cum. Pref.	11/3	10/7½
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	20/-	20/-
Boots Pure Drug Co., Ltd. Ord. (5/-)	55/6	55/-
Borax Consolidated, Ltd. Pfd. Ord. (£)	112/6	112/6
,, Defd. Ord.	28/1½	27/6
,, 5½% Cum. Pref. (£10)	£12/5/-	£12/5/-
,, **4½% Deb. (1st Mort.) Red. (£100)**	£107/10/-	£107/10/-
,, **4½% 2nd Mort. Deb. Red. (£100)**	£105/10/-	£105/10/-
Bradford Dyers' Association, Ltd. Ord.	8/9	8/9
,, 5% Cum. Pref.	12/6	11/3
,, **4% 1st Mort. Perp. Deb. (£100)**	£86/10/-	£86/10/-
British Celanese, Ltd. 7% 1st Cum. Pfd.	25/-	24/9
,, 7½% Part. 2nd Cum. Pref.	20/9	21/-
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	6/-	6/-
,, 4% 1st Mort. Deb. Red. (£100)	£97	£97
British Cyanides Co., Ltd. Ord. (2/-)	4/3	4/3
British Drug Houses, Ltd. Ord.	21/3	21/3
,, **5% Cum. Pref.**	21/10½	21/10½
British Glues and Chemicals, Ltd. Ord. (4/-)	8/-	8/-
,, 8% Pref. (Cum. and Part.)	29/4½	29/4½
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	48/9	47/10½
,, 5½% Cum. Pref.	26/3	26/3
,, **4½% First Mort. Deb. Red. (£100)**	£107/10/-	£107/10/-
British Oxygen Co., Ltd. Ord.	93/9	91/3
,, **6½% Cum. Pref.**	**32/6**	**32/6**
British Portland Cement Manufacturers, Ltd. Ord.	88/9	87/6
,, 6% Cum. Pref.	29/4½	28/9
Bryant & May, Ltd. Pref.	67/6	67/6
Burt, Boulton & Haywood, Ltd. Ord.	21/3	21/3
,, 7% Cum. Pref.	28/9	28/9
,, **6% 1st Mort. Deb. Red. (£100)**	£102/10/-	£102/10/-
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	112/6	112/6
,, **4% 1st Mort. Deb. Red. (£100)**	£96/10/-	£96/10/-
Calico Printers' Association, Ltd. Ord.	8/1½	8/1½
,, 5% Pref. (Cum.)	12/6	11/3
Cellulose Acetate Silk Co., Ltd. Ord.	12/2½	12/2½
,, Deferred (1/-)	2/1½	2/1½

Name.	March 24.	March 17.
Consett Iron Co., Ltd. Ord.	12/3	13/-
,, 8% Pref.	37/6	37/6
,, **6% First Deb. stock, Red. (£100)**	£115/10/-	£110/10/-
Cooper, McDougal & Robertson, Ltd. Ord.	35/-	35/-
,, 7% Cum. Pref.	28/9	28/9
Courtaulds, Ltd. Ord.	50/10½	51/3
,, 5% Cum.	25/-	25/9
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre-Pref.	25/-	25/-
,, Cum. 6% Pref.	28/1½	28/1½
,, 6½% Cum. Pref.	31/3	31/3
,, **7½% "A" Cum. Pref.**	**32/6**	**32/6**
Distillers Co., Ltd. Ord.	100/-	99/9
,, 6% Pref. Stock Cum.	30/-	30/-
Dorman Long & Co., Ltd. Ord.	28/9	28/1½
,, Pref. Ord.	41/3	41/3
,, 6½% Non-Cum. 1st Pref.	25/3	24/6
,, 8% Non-Cum. 2nd Pref.	25/9	25/9
,, **4% First Mort. Perp. Deb. (£100)**	£103/10/-	£103/10/-
,, 5% 1st Mort. Red. Deb. (£100)	£105/10/-	£105/10/-
English Velvet & Cord Dyers' Association Ltd. Ord.	3/9	3/9
,, **5% Cum. Pref.**	**7/6**	**7/6**
,, **4% First Mort. Deb. Red. (£100)**	£68	£68
Fison, Packard & Prentice, Ltd. Ord.	45/-	43/9
,, 7% Non-Cum. Pref.	31/10½	31/10½
,, **4½% Debs. (Reg.) Red. (£100)**	**£106**	**£106**
Gas Light and Coke Co.	27/9	27/9
,, 3½% Maximum Stock (£100)	£90/10/-	£90/10/-
,, 4% Consolidated Pref. Stock (£100)	£108/10/-	£108/10/-
,, 3% Consolidated Deb. Stock, Irred. (£100)	£90/10/-	£90/10/-
,, 5% Deb. Stock Red. (£100)	£118/10/-	£118/10/-
,, 4½% Red. Deb. Stock (1960-65) (£100)	£115/10/-	£115/10/-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	**15/7½**	**15/7½**
,, 7% Prefd. Ord. (10/-)	13/1½	13/9
,, 7% Cum. Pref.	28/9	30/-
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	**24/4½**	**24/4½**
,, 6½% Cum. Pref.	28/9	28/9
Imperial Chemical Industries, Ltd. Ord.	39/9	39/-
,, Deferred (10/-)	9/7½	9/7½
,, 7% Cum. Pref.	33/9	33/9
Imperial Smelting Corporation, Ltd. Ord.	17/9	17/6
,, 6½% Pref. (Cum.)	25/7½	25/7½
International Nickel Co. of Canada, Ltd. Cum.	$50	$50¼
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	**105/-**	**105/-**
,, **4% Mort. Deb. Red. (£100)**	**£98/10/-**	**£98/10/-**
Laporte, B., Ltd. Ord.	120/-	120/-

Name.	March 24.	March 17.
Lawes Chemical Co., Ltd. Ord. (1/-)	8/9	8/9
,, 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
Lever Bros., Ltd. 7% Cum. Pref.	31/6	31/-
,, 8% Cum. "A" Pref.	32/6	32/-
,, 20% Cum. Prefd. Ord.	79/4½	79/4½
,, 5% Cons. Deb. (£100)	£106/10/-	£105/10/-
,, 4% Cons. Deb. (£100)	£104/10/-	£104/10/-
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
,, 6% 2nd Pref. (5/-)	6d.	6d.
,, 6% 1st Debs. (Reg.)	£40	£40
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
,, 8% Part. Prefd. Ord. (10/-) ...	9d.	9d.
,, 7½% Cum. Pref.	1/6¾	1/6¾
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	46/-	45/-
,, 1st Pref. 6½% Cum.	32/-	32/-
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	£73/10/-	£70/10/-
Reckitt & Sons, Ltd. Ord.	112/6	115·
,, 4½% Cum. 1st Pref.	24/4½	24/4½

Name.	March 24.	March 17.
Salt Union, Ltd. Ord.	43/9	43/9
,, Pref.	48/1½	48/1½
,, 4½% Deb. (£100)	£107/10/-	£107/10/-
South Metropolitan Gas Co. Ord. (£100) ...	£121/10/-	£122/10/-
,, 6% Irred. Pref. (£100)	£149/10/-	£149/10/-
,, 4% Pref. (Irred.) (£100)	£105/10/-	£105
,, Perpetual 3% Deb. (£100)	£89/10/-	£89/10/-
,, 5% Red. Deb. 1950-60 (£100)...	£115/10/-	£115/10/-
Staveley Coal and Iron Co., Ltd. Ord. ...	51/3	50/-
Stevenson & Howell, Ltd. 6½% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	88/9	88/9
Unilever, Ltd. Ord.	32/6	31/3
,, 7% Cum. Pref.	30/3	30/3
United Glass Bottle Manufacturers, Ltd. Ord.	44/4½	45/-
,, 7½% Cum. Pref.	32/6	32/6
United Molasses Co., Ltd. Ord. (6/8)	23/9	23/9
,, 6% Cum. Pref.	26/3	26/3
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	12/6	12/6
,, 7% Cum. Pref.	25/-	25/-
,, 4¾% Deb. Red. (£100)	£104	£104

Inventions in the Chemical Industry

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

ASPHALT BITUMEN free from paraffin, production.—K. Kell and W. H. Schmitz. Dec. 4, 1933. 443,287.

AZO DYESTUFFS, and dyeing and printing preparations, manufacture.—I. G. Farbenindustrie. Aug. 26, 1933. 443,222.

ADHESIVE COMPOSITIONS.—Distillers Co., Ltd., and P. D. Coppock. Aug. 22, 1934. 443,223.

OXIDATION OF SOLUTIONS and suspensions.—National Processes, Ltd., and A. R. Gibson. Aug. 23, 1934. 443,371.

SYNTHETIC RESINS suitable for the manufacture of dentures, production.—Bakelite, Ltd. (Bakelite Corporation). Aug. 23, 1934. 443,230.

PIGMENTED COATING-COMPOSITIONS.—E. I. du Pont de Nemours and Co. Aug. 23, 1933. 443,235.

VULCANISATION OF RUBBER.—E. I. du Pont de Nemours and Co. Aug. 23, 1933. 443,236.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. Aug. 24, 1933. 443,242.

PHOTOGRAPHIC EMULSIONS, manufacture.—W. W. Groves (I. G. Farbenindustrie). Aug. 27, 1934. 443,245.

CONDENSATION PRODUCTS, manufacture.—W. W. Groves (I. G. Farbenindustrie). Aug. 27, 1934. 443,436.

BARBITURIC ACID and salts thereof, preparation—L. Mellersh-Jackson (E. Lilly and Co.). Sept. 4, 1934. 443,300.

BLEACHING, WASHING AND CLEANSING AGENTS, particularly for use in water containing iron.—W. J. Tennant (Henkel and Cie. Ges.). Sept. 5, 1934. 443,498.

PARASITICIDAL COMPOSITIONS.—L. Mellersh-Jackson (California Spray-Chemical Corporation). Sept. 6, 1934. 443,444.

HARD CEMENTED CARBIDE MATERIAL.—A. H. Stevens and Firth-Sterling Steel Co. Sept. 29, 1934. 443,303.

LOWER BOILING HYDROCARBONS by destructive hydrogenation of liquid carbonaceous materials of higher boiling-point range, production.—International Hydrogenation Patents Co., Ltd. Nov. 18, 1933. 443,306.

COMPRESSED SHEET MATERIAL having an opaque decorative surface, manufacture.—Soc. of Chemical Industry in Basle. June 7, 1934. 443,449.

METAL POWDERS or mixtures of metal powders and metal oxide powders, manufacture.—Dr. W. Zeiss. Nov. 1, 1933. 443,450.

GAS MIXTURES CONTAINING NITROGEN or nitrogen and hydrogen, manufacture and production.—Coutts and Co. and F. Johnson (legal representatives of J. Y. Johnson (deceased)) (I. G. Farbenindustrie). Nov. 10, 1934. 443,308.

SULPHUR DIOXIDE FROM ACID SLUDGE, production.—Chemical Construction Corporation.—Dec. 2, 1933. 443,452.

ALKENES WITH AT LEAST FIVE CARBON ATOMS in the molecule, and/or derivatives thereof, process for preparing.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Jan. 10, 1934. 443,263.

HETEROCYCLIC MERCURY COMPOUNDS, manufacture.—Soc. of Chemical Industry in Basle. Jan. 6, 1934. 443,517.

PRODUCING FAST PRINTS ON PAPER, process.—Soc. of Chemical Industry in Basle. Jan. 15, 1934. 443,394.

ORGANIC CONDENSATION PRODUCTS, particularly for the treatment of textiles, manufacture and use.—Deutsche Hydrierwerke A.-G. Jan. 16, 1934. 443,265.

THERAPEUTICALLY-ACTIVE DERIVATIVE of phthalic acid, process for manufacture.—W. J. Tennant (Chemische Fabrik Grünau Landshoff and Meyer A.-G.). Feb. 8, 1935. 443,396.

PROMOTING FERMENTATIONS, process.—K. F. Von Gebsattell (nee Falkenhayn). Feb. 10, 1934. 443,269.

REDUCTION PRODUCTS of the male sexual hormone and substances, production.—Schering-Kahlbaum A.-G. Feb. 24, 1934. 443,463.

SULPHUR DIOXIDE FROM GASES containing same, recovery.—Metallges, A.-G. July 20, 1934. 443,314.

INDIGOID DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. April 20, 1934. 443,275.

SPONGE RUBBER from aqueous rubber dispersions, production.—Metallges, A.-G. May 17, 1934. 443,323.

VINYL DERIVATIVES, production.—Kodak, Ltd. May 23, 1934. 443,324.

CARBON BLACK.—Krebs Pigment and Color Corporation. May 18, 1934. 443,470.

HEAT-STABLE POLYSTYROL, process for making.—Dynamit-Akt.-Ges. Vorm A. Nobel and Co. July 23, 1934. 443,405.

CUPRIC MIXTURES FOR AGRICULTURAL PURPOSES and method for preparing same.—P. F. J. Souviron, P. Debin and P. E. Bigourdan. June 18, 1934. 443,328.

CHEMICAL STABILISATION OF PAPER and product.—Ontario Research Foundation. Dec. 10, 1934. 443,534.

REMOVAL OF HYDROGEN SULPHIDE and other sulphur compounds from gases, especially coal-distillation gases.—H. Koppers' Industrieele Maatschappij Naamlooze Vennootschap. June 29, 1934. 443,407.

CHLOROPYRENEQUINONES, manufacture.—Soc. of Chemical Industry in Basle. July 7, 1934. 443,408.

LOWER BOILING HYDROCARBONS by destructive hydrogenation of liquid carbonaceous materials of higher boiling-point range, production.—International Hydrogenation Patents Co., Ltd. Nov. 18, 1933. 443,338.

LOWER BOILING HYDROCARBONS by destructive hydrogenation of liquid carbonaceous materials of higher boiling-point range, production.—International Hydrogenation Patents Co., Ltd. Nov. 18, 1933. 443,339.

ORGANIC FLUORINE COMPOUNDS.—British Thomson-Houston Co., Ltd. July 28, 1934. 443,340.

THERAPEUTICALLY ACTIVE COMPOUND of hexamethylenetetramine, production.—Kali-Chemie A.-G. Oct. 15, 1934. 443,350.

PREVENTING CORROSION OF MAGNESIUM and magnesium alloys, process.—I. G. Farbenindustrie. March 1, 1935. 443,420.

Specifications Accepted with Date of Application

AZO DYESTUFFS insoluble in water, manufacture.—I. G. Farbenindustrie. Aug. 16, 1934. 443,102.

ANTI-HALATION LAYERS and filter layers for photographic purposes, manufacture.—I. G. Farbenindustrie, Aug. 19, 1933. 443,027.

AZO DYESTUFFS, process for manufacture.—I. G. Farbenindustrie. Aug. 18, 1933. 442,879.

TRIARYLMETHANE DYESTUFFS.—Imperial Chemical Industries, Ltd., F. W. Linch and H. H. Stocks. Aug. 16, 1934. 443,104.

AZO COMPOUNDS and their application, and compositions containing the same.—E. I. du Pont de Nemours and Co. Aug. 17, 1933. 442,884.

PICKLING AND CLEANING OF METALS, substances for use.—Imperial Chemical Industries, Ltd. Aug. 17, 1933. 442,885.

PHOTOGRAPHIC PRODUCTION of direct positives for autotype purposes.—I. G. Farbenindustrie. Aug. 19, 1933. 442,887.

CONCENTRATED MILK CONSTITUENTS, methods of producing.—Kraft-Phenix Cheese Corporation. Oct. 6, 1933. 442,892.

GELATINE RELIEFS FOR IMBIBITION PRINTING, manufacture.—I. G. Farbenindustrie. Aug. 19, 1933. 443,111.

PHENOLS, manufacture.—I. G. Farbenindustrie and S. Deichsel. Aug. 20, 1934. 443,113.

ALKALI METAL TITANAGES, process for manufacture.—Titanges. Aug. 22, 1933. 443,155.

VAT DYESTUFFS, manufacture and production.—Coutts and Co. and F. Johnson (legal representatives of J. Y. Johnson (deceased)) (I. G. Farbenindustrie). Aug. 29, 1934. 442,949.

AZO DYESTUFFS, manufacture.—A. Carpmael (I. G. Farbenindustrie). Aug. 29, 1934. 443,163.

CYANURIC ACID, manufacture and production.—Coutts and Co. and F. Johnson (legal representatives of J. Y. Johnson (deceased)) (I. G. Farbenindustrie). Sept. 1, 1934. 443,119.

POLYGLYCEROL ESTERS, production.—Lever Bros., Ltd., and R. Furness. Sept. 4, 1934. 442,950.

ORGANIC DISULPHIDES, methods of preparing.—Wingfoot Corporation. Nov. 23, 1933. 442,954.

PRINTING WOOL, process.—Soc. of Chemical Industry in Basle. Sept. 23, 1933. 442,901.

POROUS OXIDE LAYERS on aluminium and aluminium alloys for photographic purposes, process for producing.—Siemens and Halske A.-G. Sept. 27, 1934. 442,902.

LIQUID COATING COMPOSITIONS.—Carbide and Carbon Chemicals Corporation. Dec. 21, 1933. 443,049.

CONCENTRATION OF LATEX.—United States Rubber Co. Oct. 11, 1934. 442,964.

LUBRICATING OILS.—Standard Oil Development Co. July 7, 1934. 442,921.

ESTERS FROM ALCOHOLS, manufacture.—Usines de Melle. March 4, 1935. (Addition to 410,373.) 443,056.

VULCANISING RUBBER.—Wingfoot Corporation. April 7, 1934. 442,978.

LUBRICANTS AND OTHER HYDROCARBON PRODUCTS.—C. Arnold (Standard Oil Development Co.). March 15, 1935. 442,979.

AMMONIUM NITRATE having a low weight per unit volume, production.—I. G. Farbenindustrie. March 28, 1934. 442,980.

FLUX FOR CADMIUM AND ITS ALLOYS.—American Smelting and Refining Co. April 14, 1934. 442,985.

NITROBENZENE, purification.—Lonza Elektrizitätswerke und Chemische Fabrieken A.-G. June 2, 1934. 443,063.

VALUABLE LIQUID HYDROCARBONS by destructive hydrogenation of carbonaceous materials, production.—International Hydrogenation Patents Co., Ltd. July 7, 1934. 443,133.

MATERIALS FOR COMBATING PESTS.—Soc. of Chemical Industry in Basle. Aug. 14, 1934. 443,135.

IMPROVING THE CHEMICAL STABILITY of light metals and alloys thereof, process.—Vereinigte Leichtmetallwerke Ges. Nov. 1, 1934. 443,002.

PRODUCING SULPHUR by the reduction of sulphur dioxide, methods.—A. R. Lindblad. Oct. 3, 1935. 443,008.

FRACTIONATING COLUMNS.—Borsig Maschinenbau A.-G. Feb. 18, 1935. 443,092.

GLAUCONITE, treatment.—United Water Softeners, Ltd. Jan. 22, 1935. 443,010.

Applications for Patents

(February 27 to March 4.)

DYESTUFFS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 6445.

WATER-SOLUBLE DYESTUFFS of the rubicene series, manufacture. W. W. Groves (I. G. Farbenindustrie). 6446.

SILVER HALIDE EMULSIONS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 6448.

INSULIN PREPARATIONS.—H. C. Hagedorn, I. Wodstrup-Nielsen and B. N. Jensen. (Denmark, April 8, '35.) 6066.

HYDROCARBONS, ETC., production.—T. G. Hunter and A. W. Nash. 6497.

POLYMERS OF ISOBUTYLENE.—I. G. Farbenindustrie and Standard Oil Development Co. (United States, March 29, '35.) 5881.

INTERMEDIATE PRODUCTS for dyestuffs, manufacture.—I. G. Farbenindustrie. (Germany, Feb. 27, '35.) 5914.

LOW MOLECULAR WEIGHT OLEFINE POLYMERS, production.—I. G. Farbenindustrie. (United States, June 4, '35.) 6008.

CARBONAMIDE ACIDS and their salts, production.—I. G. Farbenindustrie. (Germany, March 1, '35.) 6144.

ALKALI METAL CYANIDES, manufacture.—Imperial Chemical Industries, Ltd. and L. J. Burrage. 5942.

NEW CHEMICAL COMPOUNDS, manufacture.—Imperial Chemical Industries, Ltd., and A. W. Baldwin. 5943.

PENTAERYTHRITE, production.—Imperial Chemical Industries, Ltd., J. Clark and T. R. Paterson. 6333.

MATERIALS, treatment.—Imperial Chemical Industries, Ltd. 6478.

PLASTER BOARD, ETC.—Imperial Chemical Industries, Ltd. 6479.

WORKING-UP RESIDUES of the destructive hydrogenation of carbonaceous materials, process.—International Hydrogenation Patents Co., Ltd. (Germany, March 15, '35.) 6371.

DYESTUFFS, production.—G. W. Johnson. 6036.

LIQUID HYDROCARBONS from the gases obtained in the dry distillation of fuel, production.—G. W. Johnson. 6036.

POLYNUCLEAR COMPOUNDS, recovery.—G. W. Johnson. 6555.

CHLORINATED HYDROCARBONS, manufacture.—A. A. Levine. 6091.

NEW CHEMICAL COMPOUNDS, manufacture.—H. A. Piggott. 5943.

DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. (Switzerland, Feb. 28, '35.) 5910.

MAGNESIUM, ETC., treatment.—W. H. A. Thiemann (I. G. Farbenindustrie). 6598.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt as specified in the last available Annual Summary, is also given marked with an *—followed by the date of the Summary, but such total may have been reduced.)

S. E. PORTER AND SONS, LTD., London, E., varnish manufacturers. (M., 28/3/36.) Registered March 16, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on No. 8 Factory, Argall Avenue, Walthamstow. *£600. September 5, 1935.

VARLEY PUMPS AND ENGINEERING, LTD., London, N.W. (M., 28/3/36.) Registered March 13, mortgage, to National Provincial Bank, Ltd., securing all moneys due or to become due to the Bank; charged on freehold factory, Standard Road, Chase Estate, Acton, etc., ranking in priority to two series of debentures. *£2,500. December 25, 1935.

County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

BALL, WINIFRED E., 3 Belle Vue, Coburg Street, Plymouth, chemist. (C.C., 28/3/36.) £19 2s. 2d. February 10.

WHALLEY, H. (firm), 152 Briercliffe Road, Burnley, chemists. (C.C., 28/3/36.) £10 6s. 0d. February 25.

PIERSON, Mr. G. H., 94 Queen's Road, Bayswater, (trading as Lynn and Co.), chemist. (C.C., 28/3/36.) £22 15s. 2d. February 19.

DUNCAN, WM. LEITCH, 31 Clapham Park Road, S.W., chemist. (C.C., 28/3/36.) £10 4s. 8d. February 12.

FLETCHER, JNO., 11 Irlam Street, Newton Heath, Manchester, dyer. (C.C., 28/3/36.) £31 14s. 7d. March 5.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Belgium.—A firm of agents established at Brussels wishes to obtain the representation of United Kingdom manufacturers of chemical products for pharmaceutical trade, pharmaceutical specialities and accessories. (Ref. No. 208.)

Holland.—A firm established at The Hague wishes to obtain the representation of United Kingdom manufacturers of chemicals for use in the textile and flax industries. (Ref. No. 212.)

Uruguay.—H.M. Consul at Montevideo reports that the State Electricity Supply and Telephones Administration, Montevideo, is calling for tenders, to be presented in Montevideo by May 14, 1936, for the supply of:—(a) 30,000 kilogs. of oil for steam turbines; (b) 200,000 kilogs. of oil for Diesel engines; (c) 10,000 kilogs. of oil for compressors; (d) 65,000 kilogs. of insulating oil for transformers and switches. (Ref. T.Y. 281.)

British India.—A firm of textile mill store and machinery merchants and general commission agents established at Gheekanta Wadi, Ahmedabad wishes to obtain the representation for the area covering Gujarat and Kathiawar, on a commission, consignment or purchasing basis, of United Kingdom manufacturers of textile machinery, textile chemicals and dyestuffs. (Ref. No. 199.)

From Week to Week

THE NOMINAL CAPITAL of May and Baker, Ltd., manufacturing chemists, St. Paul's Churchyard, E.C.4, has been increased by the addition of £12,000 in £1 ordinary shares beyond the registered capital of £253,000.

THE OFFICES of the Institution of Chemical Engineers and the Chemical Engineering Group have been removed from Abbey House to 56 Victoria Street, Westminster. The telephone number remains as before: Victoria 1410.

WHEN FIRE BROKE OUT in a boilerhouse adjoining a large storage tank containing thousands of gallons of fuel oil at the oil works of Berry, Wiggins and Co., Ltd., Salford, specially trained fire-fighting employees came into action. The flames quickly involved the wood and corrugated boilerhouse. A yard away from the blaze was the side of the oil tank. The Salford fire brigade quelled the blaze by drenching the tank with powerful jets.

THE IMPORT DUTIES ADVISORY COMMITTEE gives notice that it has under consideration applications for increases in the import duties on powdered graphite, plumbago and blacklead, that is to say, graphite, plumbago and blacklead whereof more than 60 per cent. by weight passes through a No. 100 British Standards Institution sieve or more than 20 per cent. by weight passes through a No. 150 British Standards Institution sieve. Any representations which interested parties may desire to make in regard to these applications should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, London, S.W.1, not later than April 9, 1936.

A REPRESENTATION HAS BEEN MADE to the Board of Trade under Section 10 (5) of the Finance Act, 1926, for the exemption from Key Industry Duty of a universal measuring microscope having a maximum distance between centres of thirty inches, together with the following additional parts specially adapted for use therewith: (a) a graduated circular rotatable table complete with reading microscope; (b) a high centre cradle; and (c) a device for optical measurement of angular displacement about a horizontal axis, incorporating a supplementary centre. Any communications should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, S.W.1, not later than April 23.

A PLEASANT FUNCTION TOOK PLACE in the board room of the Blythe Colour Works, Ltd., on March 13, when the chairman, Mr. Fred Wildblood, presented to twenty of the staff shares to the value of £6,000 in recognition of long or special service to the company. The chairman, in making the presentation, mentioned that the recent flotation had been one of the most successful during recent years, which showed that the public appreciated Blythe Colour Works' products. He hoped that as the key men had now a real interest in the business, progress would be even more rapid than before. H was glad to say that the sales, up to date, were far in advance of last year, which was a good start for the new company. Mr. Koskie, on behalf of the recipients, thanked the directors for their generous gift.

BARRONIA METALS, LTD., announce their removal to new works and offices situate at Power Road, Gunnersbury, London, W.4. (telephone: Chiswick 6470). Their new works have been built on such lines as will render them the most modern non-ferrous foundry in Southern England. The equipment includes six oil-fired furnaces capable of melting 9,000 lb. of non-ferrous alloys per eight-hour shift; these furnaces are of the latest type made by the Morgan Crucible Co., Ltd., of Battersea. The foundry, having a floor space of 4,000 square feet, is served by a 3 ton electric crane by Marshall, Fleming and Co., of Motherwell. An interesting development is that Barronia Metals, Ltd., having been concerned for some 15 years with the manufacture of high duty bronzes, have made provision for a machine and fitting shop in order to meet the demand for finished parts and plant to their customers' specifications. An opportunity has also been taken for providing more up-to-date laboratories for metallurgical research work.

THE CHINA CLAY SHIPMENTS for February far exceeded the most sanguine expectation considering the abnormal weather conditions. Though the tonnage dealt with is about 2,500 tons less than in the preceding month of January there is an increase of 14,341 tons on February, 1935. The total shipping at Fowey for the past month was 42,335 tons compared with 39,340 tons in January, 1936, and 29,675 in February, 1935, which shows that notwithstanding the present unsatisfactory situation on the Continent the china clay industry is considerably improving. The details of February's trade are as follows:—Fowey, 36,479 tons of china clay, 3,035 tons of china stone, 2,821 tons of ball clay. Par, 7,260 tons of china clay, 197 tons of china stone. Charlestown, 5,357 tons of china clay, 60 tons of china stone. Padstow, 948 tons of china clay. Looe, 196 tons of china clay. Plymouth, 164 tons of china clay. Newham, 72 tons of china clay; and 5,678 tons of china clay were dispatched by rail—throughout by rail—making an aggregate tonnage of 62,267 compared with 47,836 tons in February, 1935.

THE NOMINAL CAPITAL of England Hughes Bell and Co., Ltd., chemical, paint, varnish, soap and rubber solution manufacturers, Warrington, has been increased by the addition of £4,000 in £1 ordinary shares beyond the registered capital of £6,000.

A PAPER on "Modern Methods of Commercial Filtration" which Mr. E. A. Alliott was to have read at a meeting of the Chemical Engineering Group on April 3 has been transferred to the Chemical Engineering Congress in June. The meeting arranged for April 3 has been cancelled.

A FIRE OCCURRED on March 18 at the works of the British Thermit Co. at Garston, a warehouse containing sacks of aluminium and magnesium filings being involved. The fire is believed to have been caused by the overheating of a reducing oven.

LAST WEEK'S ANNOUNCEMENT that British Tar Products, Ltd., had removed to 418a Glossop Road, Sheffield, was somewhat premature. Extensive alterations are being carried out at the new premises and the removal depends upon the date of their completion. For the present therefore the company's address remains 301 Glossop Road, Sheffield (telephone 60053).

GEORGE T. HOLLOWAY AND CO., LTD., have removed their offices, laboratories and testing works from Limehouse to Atlas Road, Victoria Road, Acton, N.W.10. The site formerly occupied at Limehouse has been acquired by the London County Council. The increased accommodation at Acton affords additional facilities for the testing of ores and mineral products, investigations into chemical and metallurgical processes and general analytical work.

ALTHOUGH THE BRITISH INDUSTRIES FAIR closed only at the end of last month it is announced that provisional applications for space for the 1937 Fair already amount to 561,800 sq. ft. Figures supplied by the Department of Overseas Trade show that 669 exhibitors have made provisional application for 351,800 sq. ft. in the London sections. The Birmingham Chamber of Commerce, which organises the engineering and hardware section in collaboration with the Department of Overseas Trade, announces that definite bookings for the 1937 Fair in Birmingham amount to 60,000 sq. ft. to 147 exhibitors, while the reservations made by letter account for a further 150,000 sq. ft.

Forthcoming Events

LONDON

Mar. 30.—Institution of the Rubber Industry, London and District Section. "The Study of Cure in Latex," Dr. C. F. Flint and Dr. W. J. S. Naunton. British Empire Club, 12 St. James's Square. 7.30 p.m.

Apr. 1.—Society of Public Analysts. "The Sulphuric Acid Test for Liquid Paraffin." C. Edward Sage and S. G. E. Stevens. "The Determination of Moisture Content by Distillation with Liquids Immiscible with Water," L. A. Warren. "An Apparatus for the Determination of Small Percentages of Water or Oil," I. C. P. Smith. "The Mydriatic Effect of Cocaine and its Differentiation from the Atropine Group of Alkaloids," K. R. Ganguly. Chemical Society's Rooms, Burlington House. 8 p.m.

Apr. 2.—Chemical Society. Ordinary scientific meeting. Burlington House. 8 p.m.

BIRMINGHAM

Mar. 31.—Institute of Metals. Annual Meeting. Chairman's Address. Maurice Cook, Ph.D., M.Sc. James Watt Memorial Institute, Birmingham. 7 p.m.

HULL

Mar. 31.—Hull Chemical and Engineering Society. "Some Protective Coatings used in Industry." H. J. Stern, Ph.D. Municipal Technical College, Hull. 7.45 p.m.

LEICESTER

Apr. 1.—Leicester Literary and Philosophical Society, Chemical Section. Annual general meeting. 7.30 p.m.

LIVERPOOL

Apr. 2.—British Association of Chemists (Liverpool Section). Annual meeting. Exchange Hotel, Liverpool. 7.30 p.m.

MANCHESTER

Apr. 3.—Society of Chemical Industry (Manchester Section). Annual general meeting. Engineers' Club, 17 Albert Square, Manchester. 7 p.m.

Apr. 3.—Society of Dyers and Colourists (Manchester Section). Annual general meeting, short papers and discussion. Literary and Philosophical Society, 36 George Street, Manchester. 7 p.m.

Company News

Jenson and Nicholson.—The payment of two and a quarter years' arrears of dividend on 7 per cent. "A" preference shares of £1 is announced.

A. and F. Pears.—The profit for 1935 is £79,809, plus £26,075 brought in, making £105,884. Preference dividend requires £12,000, preferred ordinary dividend at rate of 12 per cent. £38,400, and ordinary dividend of 15 per cent. £30,000, leaving £25,484 to go forward.

John Knight.—The profit for 1935 is £246,455, against £255,224; to which is added £138,107 brought in, making £384,562. The dividend on 25 per cent. preferred ordinary shares takes £125,000; ordinary dividend 40 per cent. (same), £120,000, leaving £139,562 to go forward.

British Aluminium.—Trading profits of £481,706 are shown in the full accounts for 1935, compared with £379,151 in 1934. Net profits rose by over £76,600, to £246,852. The ordinary share dividend is maintained at 7½ per cent. and £62,227 carried forward, against £55,375.

British American Oil.—The report for 1935 shows a profit of $5,147,500, against $4,757,500. After deducting $1,292,500 for depreciation, $515,000 for taxes, $315,500 for debenture interest, and other items, there is a net profit of $2,884,750. Regular quarterly dividends totalling $2,098,000 have been paid.

Morgan Crucible.—Trading profits, after depreciation, etc., have risen from £336,606 to £345,857, and total revenue is £11,497 higher at £373,289. A total of £80,925 is again capitalised as 5 per cent. obligations to be retained for employment in the business and a total of 1s. 4½d. per £1 of stock is to be paid on the ordinary, the same as in 1934. The carry-forward is £214, against £720. Meeting, Church Road, S.W.11, March 31, at 11 a.m.

American Smelting and Refining.—The report for 1935 states that income includes two non-recurring items amounting to net profit of $1,297,541. Since the end of 1935 the company has paid $4,900,000 of bank loans incurred at time of refunding 5 per cent. bonds. The company has called for redemption at par on April 1, 1936, $2,041,000 of outstanding 4 per cent. bonds, amount outstanding will thus be reduced to $22,959,000, as of April 1, 1936. Accounts show net income from current operations at $21,573,752.

Worthington-Simpson.—A trading profit for 1935 at £52,167 (increase £21,737) is announced. Adding dividends from investments and transfer fees £288 and profit on investments £169 gave £52,624. After debenture interest, depreciation, and other charges totalling £25,127, the net figure was £27,497 (£13,714), plus £44,557 brought in. The dividend of 18 per cent. on 74,010 preference shares for three years ended December 31, 1934, less tax, absorbed £10,324. In this connection the report explains that holders of 124,758 6 per cent. preference of £1 waived their claims to participate in this dividend. Transferred to preference dividend equalisation reserve is £18,485, and £9,243 goes to payment of 6 per cent. preference dividend for 1935. (Claims to dividend for 1930 and 1931 were waived.) The dividend on ordinary, 5 per cent., tax free, requires £10,000 and £24,002 goes forward. Meeting, Queen's House, W.C., April 8, at 12 noon.

Tungsten Manufacturing.—The profit to September 30 is £916 (against £3,977). Allowing for depreciation £852 (£831), adding £1,452 brought in, and providing £545 for income-tax there is £970 to go forward.

William Gossage and Sons.—The report for 1935 shows net profit £278,734 (against £291,347), to which is added £47,054 brought in. The 5 per cent. preference dividend takes £22,500, 6½ per cent. Preference dividend £48,750; ordinary dividend 30 per cent. (same), £210,000, leaving £44,538 to go forward.

Berry Wiggins.—The net profit for 1935 is £34,595, against £29,381, to which is added £44,924 brought in, making £79,520. The dividend on 5½ per cent. preference shares on instalments paid up for period ended December 16, 1935, takes £5,254; final dividend on "A" ordinary, 5 per cent., making 10 per cent. (same); dividend on "B" ordinary, 10 per cent., and £52,766 goes forward.

Thos. Firth and John Brown.—The directors have decided to recommend a dividend of 12½ per cent., tax free, on the ordinary shares for 1935. This compares with 5 per cent., tax free, for 1934. A transfer of £100,000 is made to general reserve, against £50,000 from 1934 profits. In November last, 100,000 "A" ordinary £1 shares were issued, but do not rank for any 1935 dividends.

United Turkey Red.—The report for 1935 shows a net profit of £3,253, against loss £10,830, to which is added £7,765 brought in, making £11,018. The directors recommend that the interim dividend on 4 per cent. first preference shares paid September 26 and final dividend payable March 27, £23,295 be charged against first preference reserve; there is no dividend on the 5½ per cent. second preference or on the ordinary shares (same).

Wright, Layman and Umney.—The payment on April 8 of a final dividend of 5 per cent., less tax, on ordinary shares for 1935 is announced. On that date there will also be a distribution of 2½d. per share ex investment realisation profits. In view of fact that a distribution of 9¾d. per share was made from this source on September 30, 1935, net distribution on ordinary shares for 1935 is slightly in excess of that for 1934, when 10 per cent. was paid, less tax.

United Premier Oil and Cake.—The directors announce that net profits for 1935, after providing for tax, amount to approximately £114,000. In 1934 profits, after tax, but before debenture interest, amounted to £76,210. A final dividend of 6 per cent. is recommended on the ordinary shares, making a total of 10 per cent. for the year, compared with 7½ per cent. for 1934. In addition a scrip bonus distribution of five ordinary shares for every 100 shares held is proposed.

J. and E. Atkinson.—The report for 1935 shows net profits of £26,695, against £10,582, to which is added £3,214 reserve no longer required in connection with loss on liquidation of a subsidiary company and £5,806 brought in. The ordinary dividend 3½ per cent., first since 7 per cent. for 1929, takes £10,500; to general reserve is placed £14,597, leaving £7,617 to go forward. Under terms of issue of 5 per cent. mortgage debentures, the nine debentures of £100 each now outstanding will be redeemed on October 1 next. Meeting, 24 Old Broad Street, April 3, at 2.30 p.m.

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